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EVALUATION OF THE PASSIVE REMOTE CROSSWIND SENSOR.(U)
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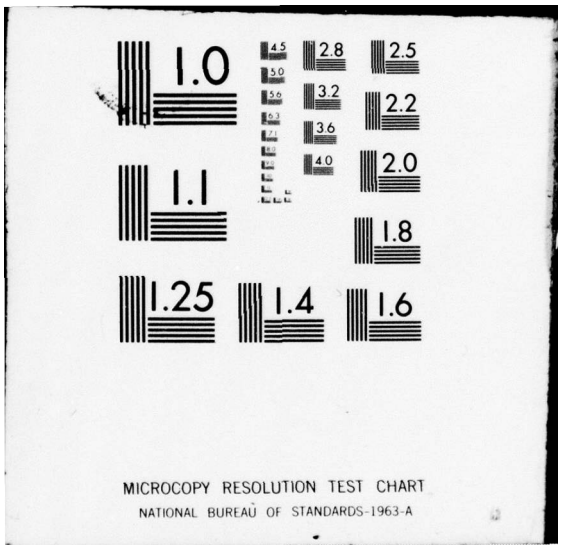
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EVALUATION OF THE PASSIVE REMOTE CROSSWIND SENSOR

MAY 1979

By

RUBEN RODRIGUEZ

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US Army Electronics Research and Development Command
Atmospheric Sciences Laboratory
White Sands Missile Range, N.M. 88002

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Field measurements of integrated path crosswinds were made at Biggs Optical Range, Biggs Army Airfield, Fort Bliss, Texas, during the period 31 January to 8 March 1978 with the passive remote crosswind sensor, a system that measures crosswinds by detecting and analyzing the movement of atmospheric scintillations. Data collected with this sensor were compared to integrated path wind averages measured by the calibrated anemometer array. Presented in this report are X-Y scatter plots, derived weighting functions, analog comparative

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20. ABSTRACT (cont)

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plots, and sampled analog data. Conclusions and recommendations are made in the last sections.

ACKNOWLEDGMENT

The authors thank Messrs. Glenn Hoidale, David Favier, and William Hatch of the Atmospheric Sensing Division and Messrs. John Hines and Charles White of the Meteorological Support Division for their assistance in manning the meteorological optical measuring system and the Optical Range at Biggs Army Airfield, Fort Bliss, Texas, during the conduct of the test.

CONTENTS

INTRODUCTION

The state of the atmosphere affects tactical Army operations and the contributing weapons systems employment. To increase the relative combat power of the friendly forces, meteorological parameters must be measured at the time and location of the action. An important parameter in atmospheric measurements, particularly for ballistic weapon employment, is integrated (projectile) path crosswinds.

The purpose of this report is to present the results of the evaluation of the passive remote crosswind sensor (PRCS), a sensor designed to measure average path crosswinds. This evaluation is based on comparative data taken during a test period of 31 January to 8 March 1978 at Biggs Optical Range (BOR), Biggs Army Airfield, Fort Bliss, Texas. Included as part of the report are daily weather summaries of atmospheric parameters prevailing at BOR.

The PRCS is a compact, lightweight, prototype instrument designed for portable passive monostatic operation. This sensor uses available ambient light for its operation. Nighttime operation can be obtained by using a light source and operating in a bistatic mode. The evaluation tests were conducted cognizant that the PRCS is a research instrument and not intended for prolonged field use without reconfiguration.

Results of collected data are presented in this report, with an evaluation and analysis that determine the accuracy, reliability, and applicability of the PRCS.

INSTRUMENTATION REQUIREMENT

Crosswinds along a ballistic projectile trajectory contribute significantly to the total weapon error. D. L. Walters[1] has shown that direct fire crosswind errors on representative armor projectiles are significantly greater than head and tail wind errors. To increase the first-round-hit probability, crosswinds must be accurately known immediately before a firing. Knowledge and application of crosswind information to fire control systems can also increase the standoff range of friendly weapons without degrading the accuracy of the weapons.

Several remote crosswind sensors have been developed in the recent past. Four systems were evaluated at BOR during the test period. The evaluation results of the PRCS are presented in this report. The results of the other system evaluations are reported separately.

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[1]D. L. Walters, 1975, "Crosswind Weighting Functions for Direct-Fire Projectiles," ECOM Report 5570, Atmospheric Sciences Laboratory, White Sands Missile Range, NM

The PRCS is a prototype of a system that can become a candidate for future tactical weapon system integration as a sensor in tank or mobile antitank fire control systems.

An experimental prototype model of the PRCS[2,3,4] proved the concept of operational feasibility but was bulky and limited to AC power operation. The system used for the test discussed herein was an exploratory development prototype that was completed in 1977. The evaluation of this system contributes to the necessary data base required for continuing future development to satisfying the stated tactical requirements.

System Description

The PRCS is a compact, lightweight, battery-operated sensor system capable of passively acquiring scintillation data and resolving atmospheric wind components from these sensed data. Characteristics of the instrument tested (fig. 1) are summarized in table 1. The PRCS is compact because it uses ambient light from a naturally illuminated scene for operation rather than requiring a laser or other light source for supplementary illumination.

The operation of the PRCS is based on the principle that thermal gradients in the atmosphere cause variations in the index of refraction which in turn generate scintillation patterns that are transported by the wind. The PRCS measures the transverse speed of these patterns and electronically calculates the crosswind velocity.

The PRCS consists of two identical sets of optics with photodiodes located near their focal points. A particular scintillation pattern "signature" will be detected by one of the photodiodes; and as this pattern is transported by the wind, a short time later it will be detected by the other photodiode. The photodiode signal output is filtered and delayed by use of a shift register delay technique.[5] Next, fourteen

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[2]G. R. Ochs and G. F. Miller, 1972, "Pattern Velocity Computers: Two Types Developed for Wind Velocity Measurement by Optical Means," Review of Scientific Instruments, Vol 43, No. 6, pp 879-882

[3]S. F. Clifford, G. R. Ochs, and Ting-i Wang, 1975, "Optical Wind Sensing by Observing the Scintillations of a Random Scene," Applied Optics, Vol 14, No. 12, pp 2844-2850

[4]D. L. Walters, 1977, "Passive Remote Crosswind Sensor," Applied Optics, Vol 16, No. 10, pp 2625-2626

[5]G. R. Ochs et al., 1977, "A Second Generation Passive Optical Crosswind Monitor," ECOM Report 77-8, Atmospheric Sciences Laboratory, White Sands Missile Range, NM

TABLE 1. PRCS PHYSICAL AND ELECTRICAL CHARACTERISTICS

Receiver optics	Twin apertures, 2.5 cm diameter
Photo detectors	A pair of United Detector Technology pin spot 2D photodiodes
Angular field of view	3 deg
Time constant	Variable (3 to 10 sec)
Function switch	Bat, 0, +, -, lock, run
Power switch	On, off, chg
Scale switch	5, 10, 20 m/sec
Output connectors	Wind, lock signal, signal 1, signal 2
Size	30 x 25 x 13 cm
Weight	2.5 kg
Power requirements	Eight 1.2 V NiCd rechargeable batteries or 120 V AC

time lags, adjustable by a feedback loop, are sequenced in order to obtain the scintillation pattern covariance function. This function provides a measurement of the time delay between the arrival of the two scintillation "signature" signals at the PRCS photodiodes. The crosswind velocity can thus be determined since the distance between the two samples volumes is a known function of the optics and remains constant. Therefore, the crosswind velocity is inversely proportional to the time delay between signals as computed from the covariance function.

TEST SUPPORT

Biggs Optical Range

This range is located approximately 400 m NW of the main runway at Biggs Army Airfield, Fort Bliss, Texas. A linear instrumented path 2064 m long is emplaced on a heading of 49 degrees from True North. Two 3.5-m towers are located at the endpoints of the path with a 3-m tower aligned at the 500-m point of the path. These towers provide solid test beds for electro-optical instrumentation. A linear array of 3-m high anemometers parallel to the path is offset 3 m to the southeast of the optical path, and these anemometers are oriented to measure northwest-southeast winds, i.e., "cross" winds to the optical path. This array consists of 21 anemometers spaced 25 m apart for the first 500 m of path length and 15 anemometers spaced 100 m apart for the remaining 1500 m of path length (fig. 2).

The instrumentation path is specifically designed to test optical wind measurement systems. All data outputs from the instrumentation are recorded in digital format in the meteorological optical measuring system van.

The surrounding terrain features are flat, with the optical path cleared of natural vegetation to minimize windflow field characteristics. Westerly winds prevail, but morning convection winds frequently occur.

Meteorological Optical Measuring System

The meteorological optical measuring system (MOMS) is a mobile, self-contained data collection and reduction system containing analog and digital subsystems specifically engineered for the measurement and recording of atmospheric meteorological data. The system utilizes an HP 2100 computer system as a controller and is managed by an in-house developed program that samples the various sensors at preset rates, stores these data, then reduces and analyzes these data according to a developed software program. Output format capabilities are raw scatter graphs, time averaged plots, printer, limited strip chart, and digital tape (fig. 3).

During these tests, analog wind data from the anemometer array and the PRCS output were recorded on digital tape. Other meteorological data simultaneously recorded were atmospheric pressure, temperature, refractive index structure coefficient, and dew point.

As part of the data collection and analysis effort, data analysis was conducted both on-line and off-line. The FORTRAN program for the primary data effort is shown in Appendix D. The primary results provided were X-Y scatter plots and resultant weighting function diagrams of the PRCS versus the anemometer array.

Remote Sensing Van

The remote sensing van (RSV) is a 5-ton, 6-by-6, M820 expandable van which contains inherent prime-mover mobility and provides test-bed facilities. The RSV "folds" to standard van width for transport and expands to 4.3 m for in situ operation. The RSV is a stable platform for optical equipment tests and provides test-bed facilities by housing test equipment and ancillary dedicated test items support equipment. An environmental isolation screen with two 30- by 45-cm integral glass plates has been fabricated for use so that the rear doors can be opened for optics line-of-sight test capability while test environmental conditions are retained inside the RSV. Figure 4 shows a "downrange" view of the RSV in operating configuration.

TEST DESCRIPTION, CONDUCT, AND PROCEDURES

The PRCS evaluation period was 31 January to 8 March 1978 at Biggs Optical Range. Equipment support was provided by MOMS and the RSV.

The evaluation mission was two-fold: (1) determining the accuracy and weighting function of the PRCS and (2) testing its operational characteristics for effects due to vibration and weather conditions (i.e., rain) on operation.

Because of its physical configuration, the PRCS is capable of immediate setup and operation. The incorporation of rechargeable NiCd batteries as the power source allows minimal setup time and adds to the portability of the instrument. Twelve-hour continuous operation with a 6-hour charge time is standard. Enhancing the scene that the PRCS is viewing will add to its capability of properly analyzing the moving scintillation patterns. This enhancement is accomplished by "aiming" the instrument at a contrasting scene. Since the PRCS has a 3-degree field of view, it is rather easy to assure that a contrasting scene viewed through the boresight is in the field of view.

Three specific targets were used: (1) a white and green van 7.3 by 4.6 m (24 by 15 ft), (2) a 1.2 by 1.8 m (4 by 6 ft) section of painted plywood, and (3) a 12.2 m (40-ft) power pole with the sky as background. Data

collected indicate that with these three targets, the PRCS obtained sufficient signal to lock on and function properly (Appendix B).

Ranges

During the tests, various ranges (distances to the target) were used to determine the effect of target range on the weighting function, lockon setting time, and signal-to-noise ratio of the PRCS. The targets previously described were sited 500 m from the PRCS. Proper lockon operation was observed in all target cases. However, placing the same target at 2000 m and operating the PRCS caused erratic output. It can be surmised that since the area of the field of view at 2000 m is 16 times as great as at 500 m, the viewed target-enhanced scintillations were so far down in signal compared to system noise that operation became intermittent at best. Tests were not extended to larger target contrasting scenes.

Variations in the weighting function due to range are presented later in the results section of this report.

Weather Conditions

The PRCS is a passive system which depends on the availability of ambient light for its operation; therefore, these tests were conducted only during daylight hours. The system can be operated during darkness by using a light source in a bistatic mode; however, in this configuration the PRCS could no longer be classified as passive.

A detailed summary of weather conditions existing during the test period is shown in Appendix C. These data are from the National Weather Service located at the El Paso International Airport approximately 6 km from BOR. A synoptic weather summary for the surface and 500 mb altitude is also shown.

The PRCS provided correlatable crosswind measurements during the ambient weather conditions experienced. Exceptions were during the periods of negligible winds (crosswinds) and rainstorms. During periods when no crosswinds were experienced, the PRCS signal would "wander" because the circuitry measured a "zero average time delay." The PRCS uses the techniques of covariance function slope proportionality to mean frequency; and with this technique, the zero average time delay signals yield an indeterminate answer. During heavy rain conditions, the overriding "optical noise" was generated and the signal-to-noise ratio degenerated below the operating threshold and caused wind signal lockon failure.

DATA COLLECTION AND RESULTS

Mathematical Background

In statistical bivariate analysis, a scatter plot is useful for the evaluation of experimental data. During these tests, scatter plots were generated to determine the accuracy of the PRCS measurements.

For the scatter plots employed, the average path crosswinds measured by "grouping" weighted anemometer outputs of the array are plotted on the abscissa, and the measured average outputs of the PRCS are plotted on the ordinate. These two values were plotted as an ordered pair. To make this comparison applicable, a large number of these sets of values had to be compared. This comparison should result in a statistically sound conclusion. A Fortran IV program (Appendix D) was developed to sample and plot the experimental data.

The usefulness and simplicity of the scatter diagram are shown in figure 5. The first (plot A) scatter plot shows a straight line with a 45-degree slope and passing through the origin. In this case a one-to-one correspondence (complete agreement) exists between the contributing systems. Plot B differs in that the slope of the line is no longer 45 degrees. This case indicates that the ordinate values have to be adjusted by including a constant multiplicative factor (M). Plot C shows the resultant line no longer passing through the origin, which signifies that the ordinate values have to be further adjusted by including an offset value, Y_o.

Since experimental data rarely yield complete correspondence between test system and "base" systems, data obtained were linearized by employing the least squares fit method. The result was then a line represented as

$$Y = A_0 + A_1 X \ ,$$

where[6]

$$A_0 = \frac{(\Sigma Y)(\Sigma X^2) - (\Sigma X)(\Sigma XY)}{N(\Sigma X^2) - (\Sigma X)^2} \ ,$$

$$A_1 = \frac{N(\Sigma XY) - (\Sigma X)(\Sigma Y)}{N(\Sigma X^2) - (\Sigma X)^2} \ ,$$

and N = number of samples.

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[6]A. Papoulis, 1965, Probability, Random Variables, and Stochastic Processes, McGraw-Hill, New York

The method of least squares allows extreme values to weigh too heavily on the result; therefore, when this technique was used to evaluate the PRCS, as well as other test systems, care was taken to investigate extremely large differences (on actual measurements) to insure that they were legitimate and not caused by mechanical or electrical malfunctions of one of the systems. Subjective caution also allowed for the fact that the mechanical anemometers have a certain amount of inertia which normally results in an erroneous output when the wind velocity is below the threshold value of the anemometers. Therefore, it is necessary to consider the values close to zero carefully and prudently. The anemometers used minimized this anomaly however, since they are research quality propeller anemometers with a threshold value of 0.2 to 0.3 m/sec.

Scatter plots can be generated by using either straight average or weighted average values from the analog wind averager (AWA) as the abscissa input. First, plots were generated by using straight average values; in later tests, after the weighting function of the PRCS had been determined, scatter plots with weighted average values from the AWA were generated.

Both types of plots are illustrated in Appendix A; however, more emphasis is given to the weighted value plots.

Before these weighted values could be used, the PRCS weighting function had to be determined. These weighting functions were computed by considering different groups of anemometers as a least squares basis set. Mathematically, the measurements of the PRCS are represented as a linear combination of different groups of anemometers which can be expressed as

$$W_{PRCS} = \sum_{i=1}^{n} a_i w_i$$

where

W_{PRCS} = PRCS wind measurements,

w_i = i^{th} anemometer wind measurement,

and

a_i = i^{th} correlation coefficient.

Various sets of coefficients, a_i, are obtained by employing different groupings of anemometers to compute n^{th} order least squares analyses. Since the range was 2 km long, weighting functions out to that range can be obtained for wind sensors being tested.

Results of Data Analysis

The weighting functions and scatter plots obtained under varying weather conditions are shown in Appendix A. A generalized weighting function and a scatter plot generally describing the PRCS are shown in figure 6.

The scatter plot of 14 February (Appendix A), along with the average values and standard deviation, shows that the values of the PRCS are related to those of the AWA by the mathematical formula, $Y = 1.101 X + 0.143$, and that the PRCS output of crosswind velocities is in agreement with the anemometer array measured crosswinds in 90 percent of the tested cases with a relative error of less than 11 percent.

It can be deduced from the weighting function plots that the PRCS weighs measured optical data in the region from 150 m to 250 m from the receiver most heavily. Also, optical crosswind measurements beyond 500 m show minimal effect on the output value of the PRCS.

CONCLUSIONS

During daylight hours and under normal area weather conditions, the PRCS performed within specified accuracy limits by measuring crosswind velocities within 7 percent of anemometer array measurements. However, under adverse weather conditions (i.e., rain) the PRCS operation deteriorated and this resulted in erroneous readings. For satisfactory operation, natural light, a contrasting scene, and atmospheric scintillations should exist. These conditions determine the signal-to-noise ratio and must occur in such a combination as to provide a signal above the PRCS threshold.

The PRCS was easy to align; the entire procedure usually took less than 5 minutes. The PRCS should be aligned after it is emplaced for operation on a vibrationless foundation. Any vibration experienced by the PRCS will be interpreted as crosswind information and thus an erroneous windspeed reading will result. PRCS operation is optically dependent on scintillation pattern movement from one detector to the other; and movement of the instrument itself rather than scintillation patterns within the scene is electronically interpreted as pattern movements, thus yielding false output data.

Operation of the PRCS requires proper system lockon to the correct signal. This lockon is electrically accomplished by means of a feedback loop. After lockon is established, the system computes the covariance function and determines the time delay necessary to measure the wind velocity. When only longitudinal winds exist, no time delay results and the system output is in error. The feedback loop causes the output signal to oscillate between maxima.

The calculated PRCS weighting function indicates that crosswinds closer than 25 m or farther than 500 m affect the output reading minimally, while crosswinds approximately 275 m from the system contribute maximum weight to the instrument's operation.

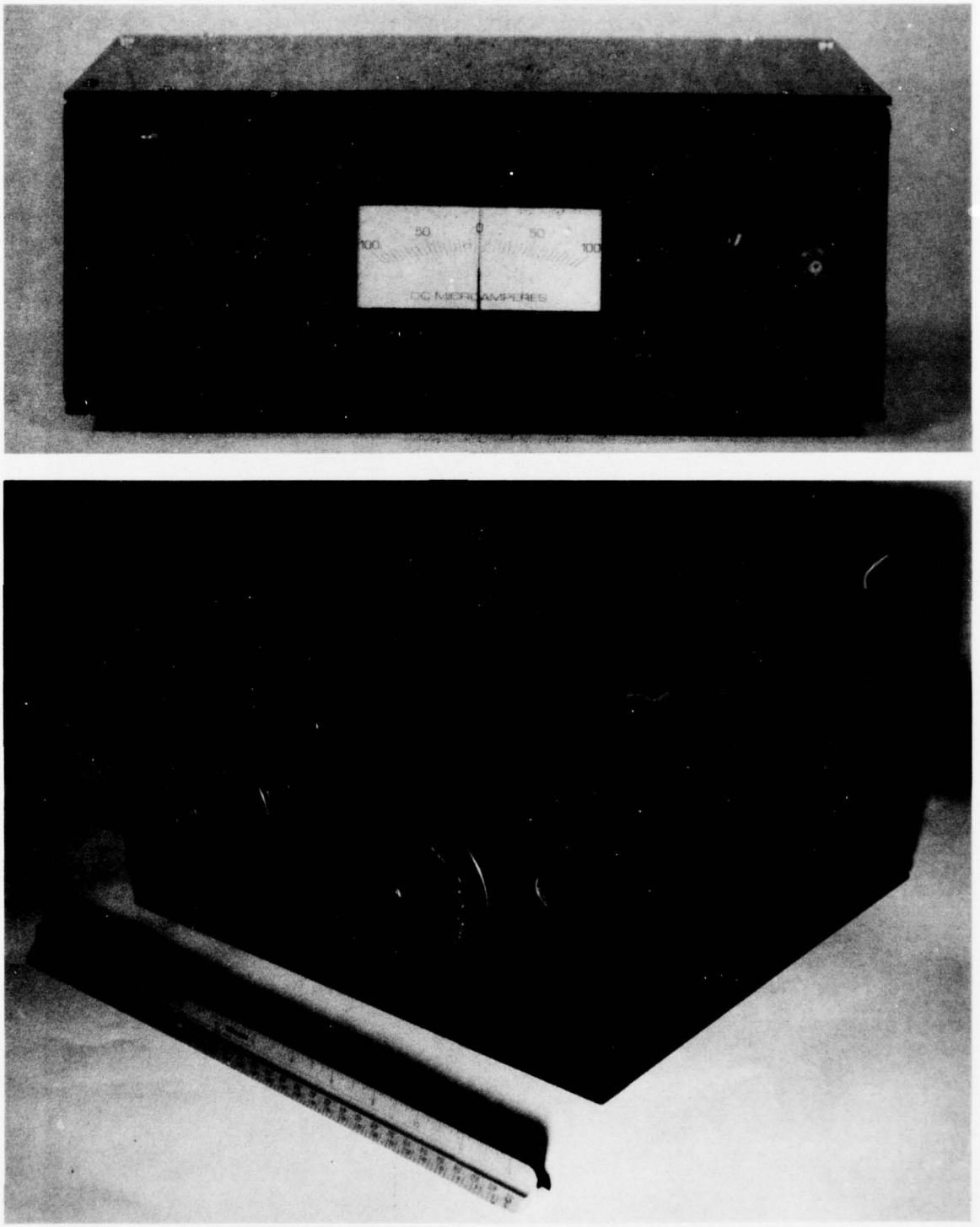

Figure 1. PRCS front and oblique views.

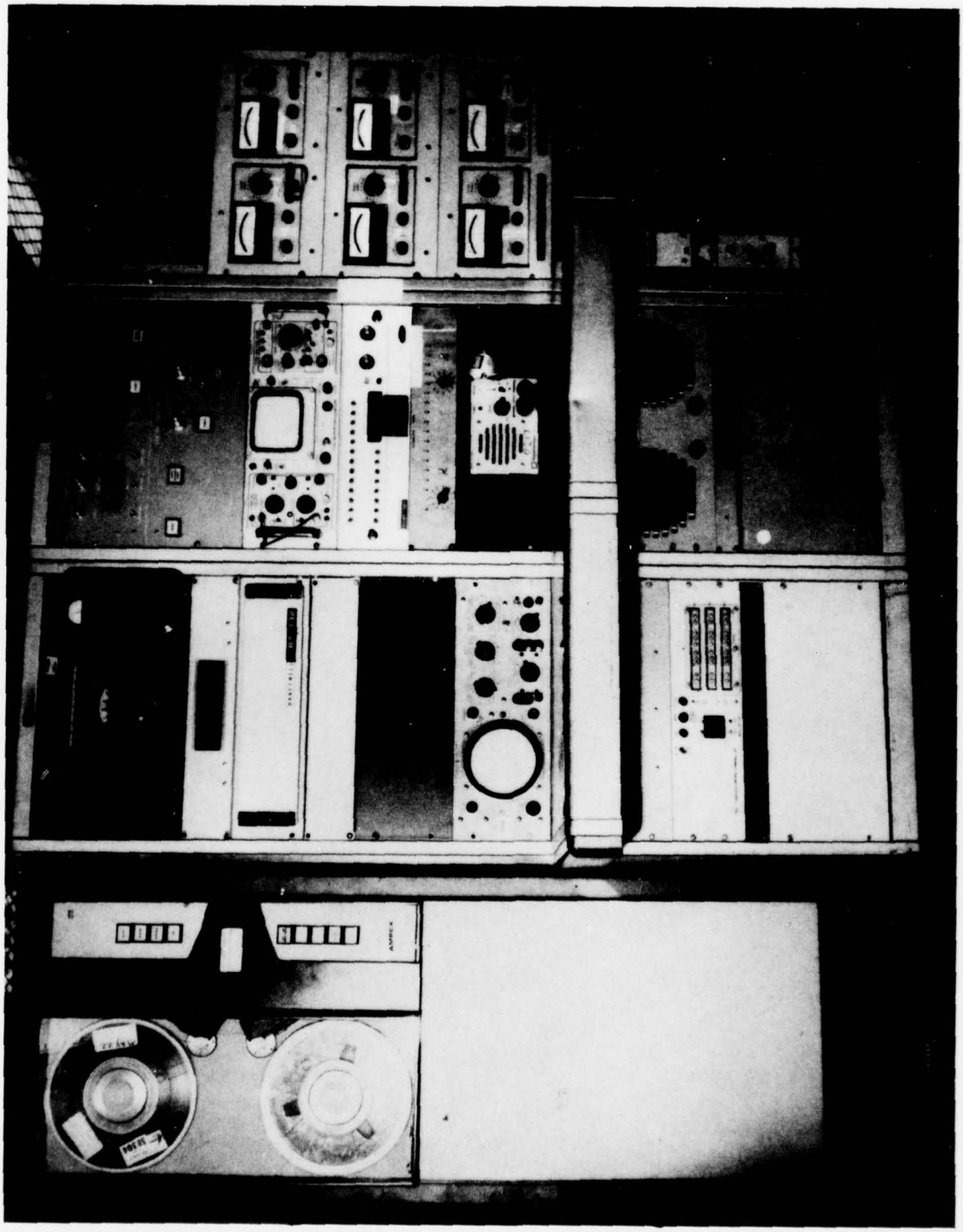

Figure 2. Biggs Optical Range.

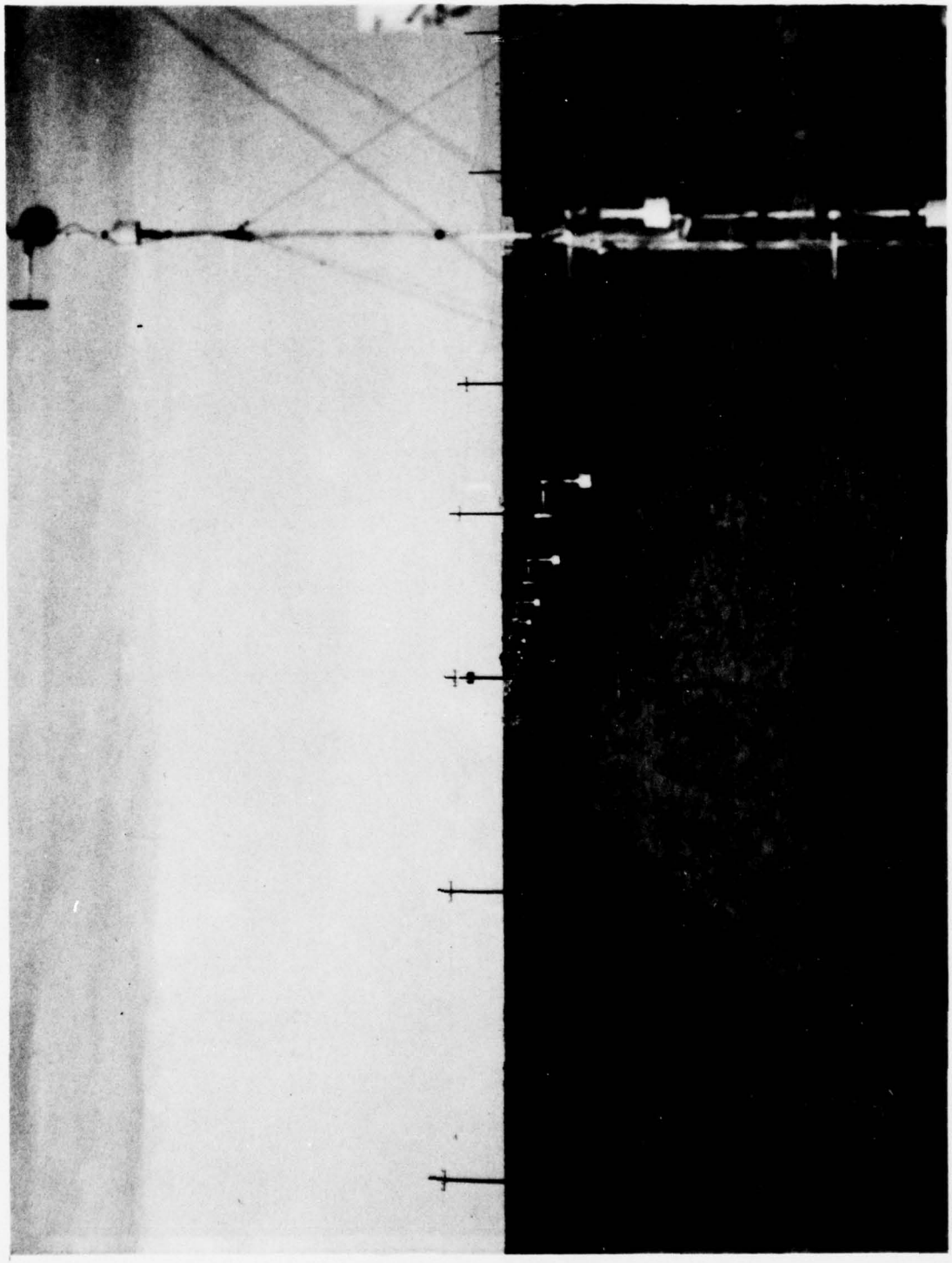

Figure 3. Meteorological optical measuring system.

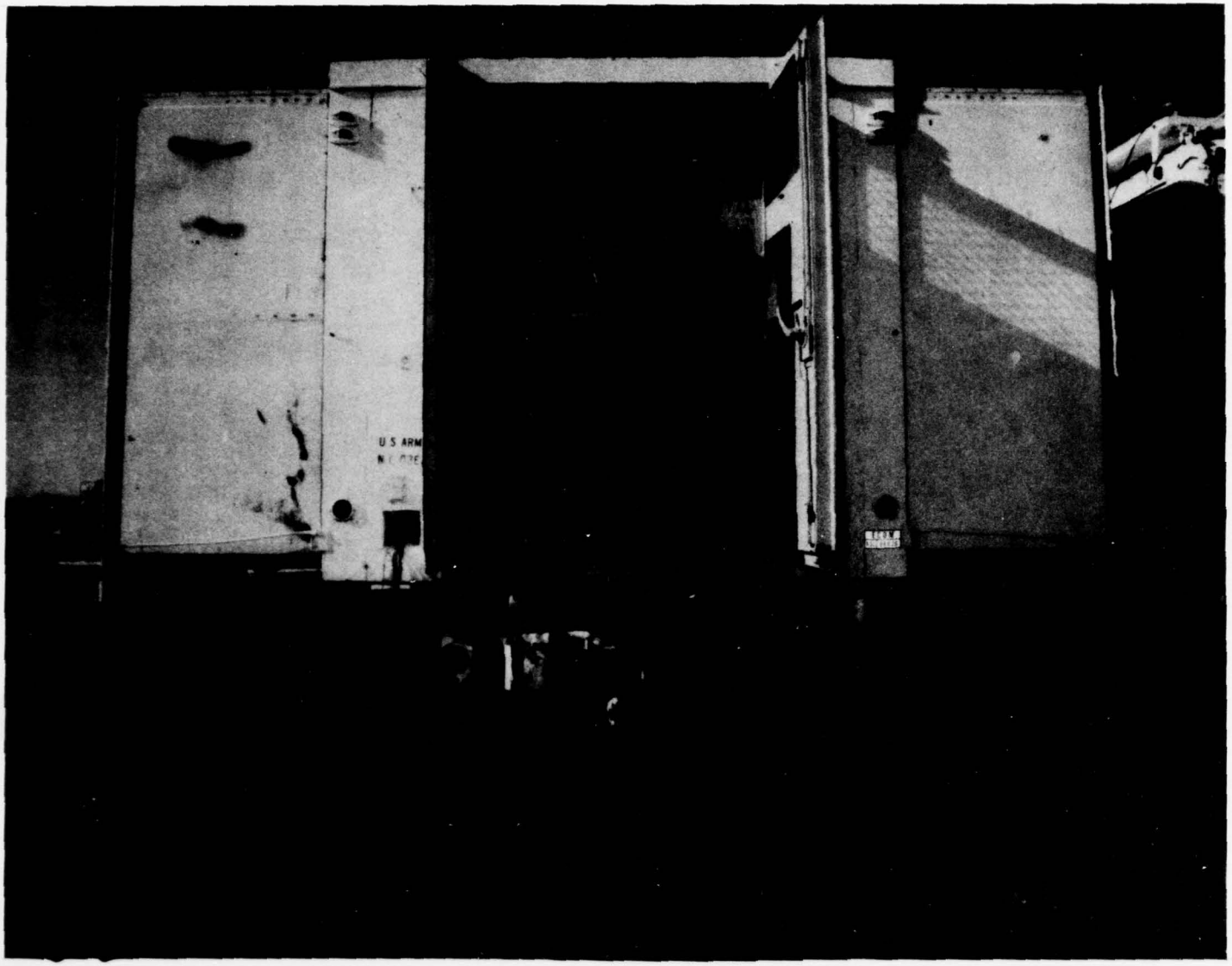

Figure 4. Remote sensing van.

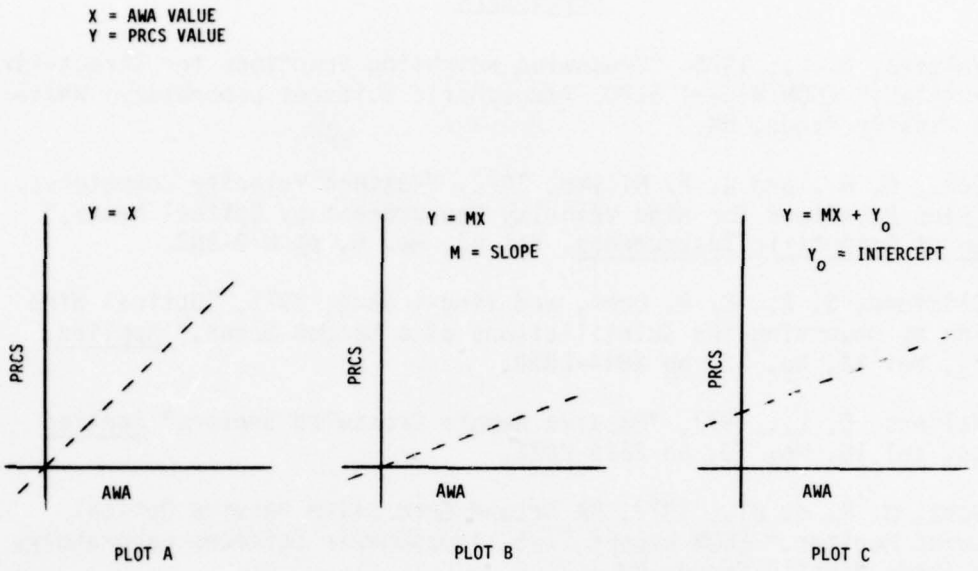

Figure 5. Scatter diagram variations.

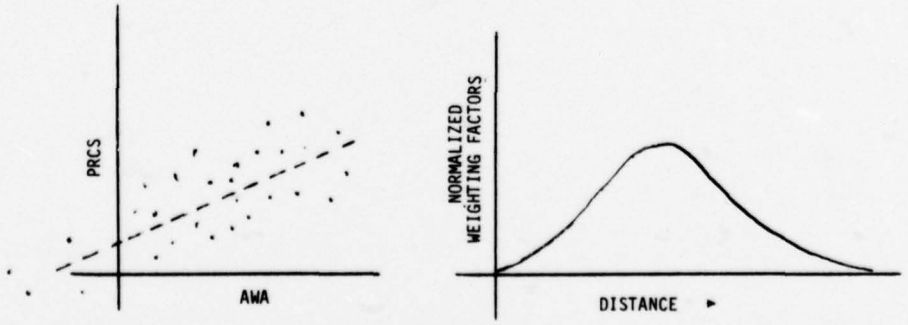

Figure 6. Typical scatter plot and weighting function.

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1. Walters, D. L., 1975, "Crosswind Weighting Functions for Direct-Fire Projectiles," ECOM Report 5570, Atmospheric Sciences Laboratory, White Sands Missile Range, NM.

2. Ochs, G. R., and G. F. Miller, 1972, "Pattern Velocity Computers: Two Types Developed for Wind Velocity Measurement by Optical Means," Review of Scientific Instruments, Vol 43, No. 6, pp 879-882.

3. Clifford, S. F., G. R. Ochs, and Ting-i Wang, 1975, "Optical Wind Sensing by Observing the Scintillations of a Random Scene," Applied Optics, Vol 14, No. 12, pp 2844-2850.

4. Walters, D. L., 1977, "Passive Remote Crosswind Sensor," Applied Optics, Vol 16, No. 10, pp 2625-2626.

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6. Papoulis, A., 1965, Probability, Random Variables, and Stochastic Processes, McGraw-Hill, New York.

APPENDIX A

PRCS SCATTER PLOTS AND WEIGHTING FUNCTIONS

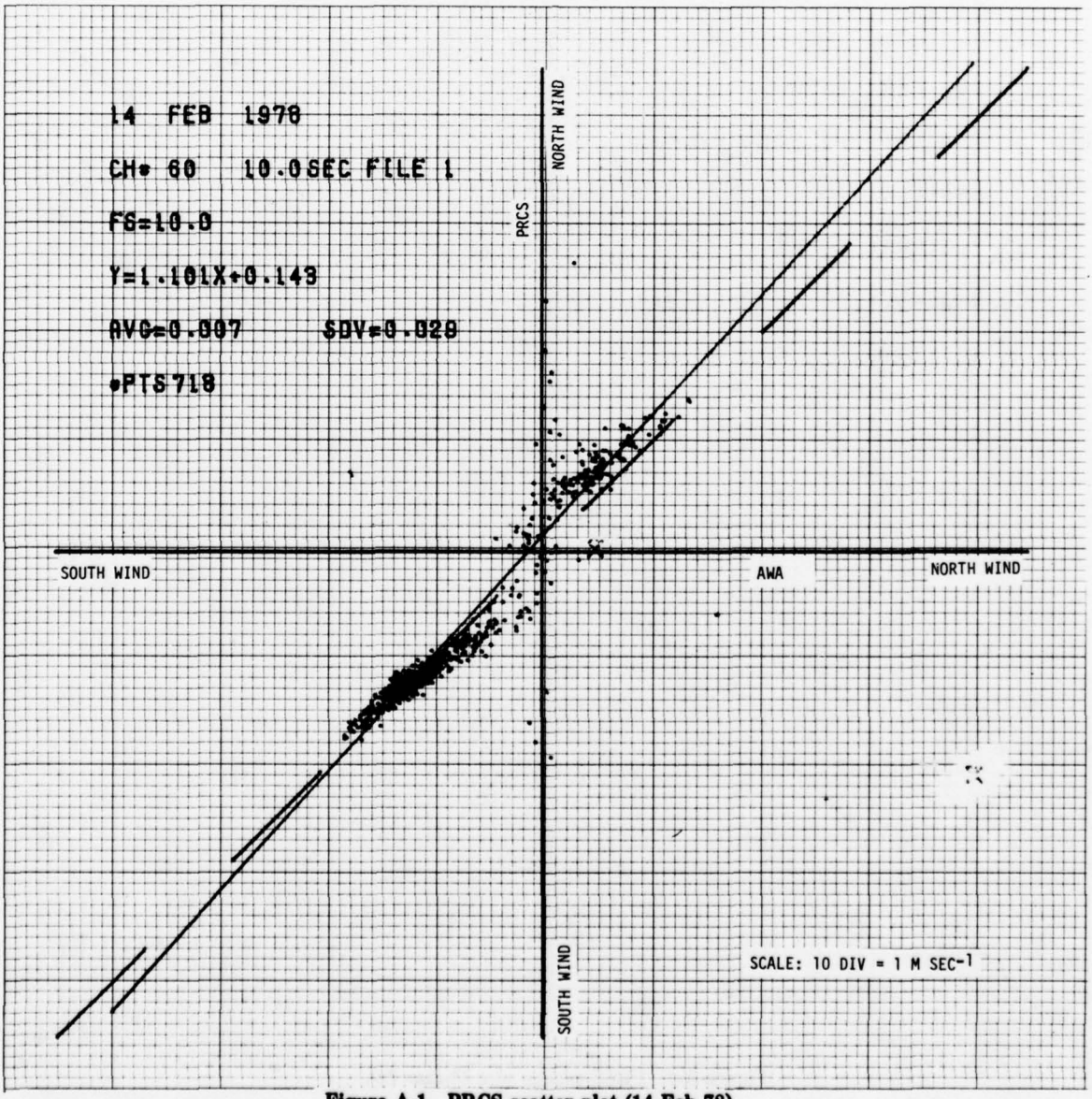

Figure A-1. PRCS scatter plot (14 Feb 78).

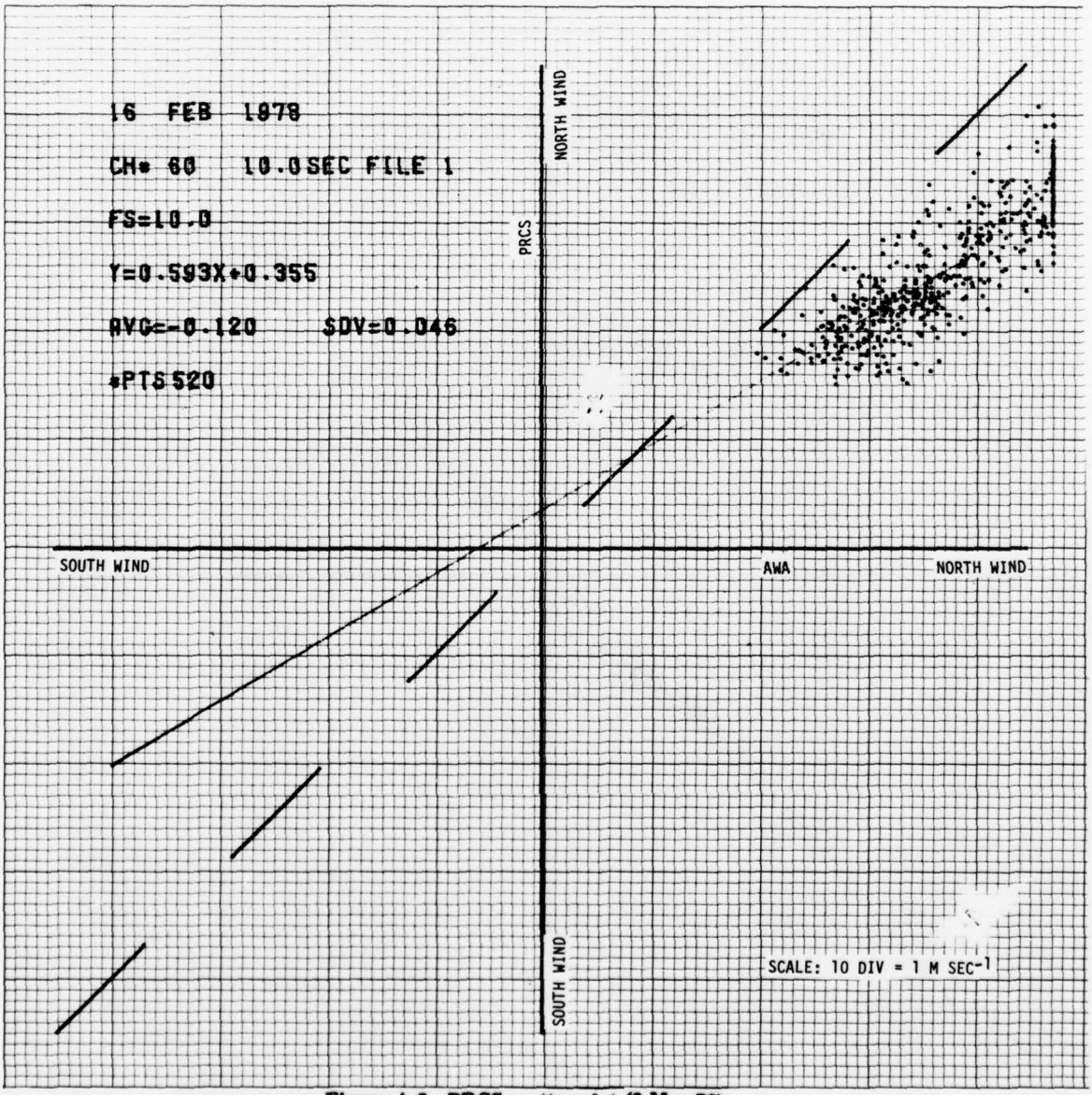

Figure A-2. PRCS scatter plot (3 Mar 78).

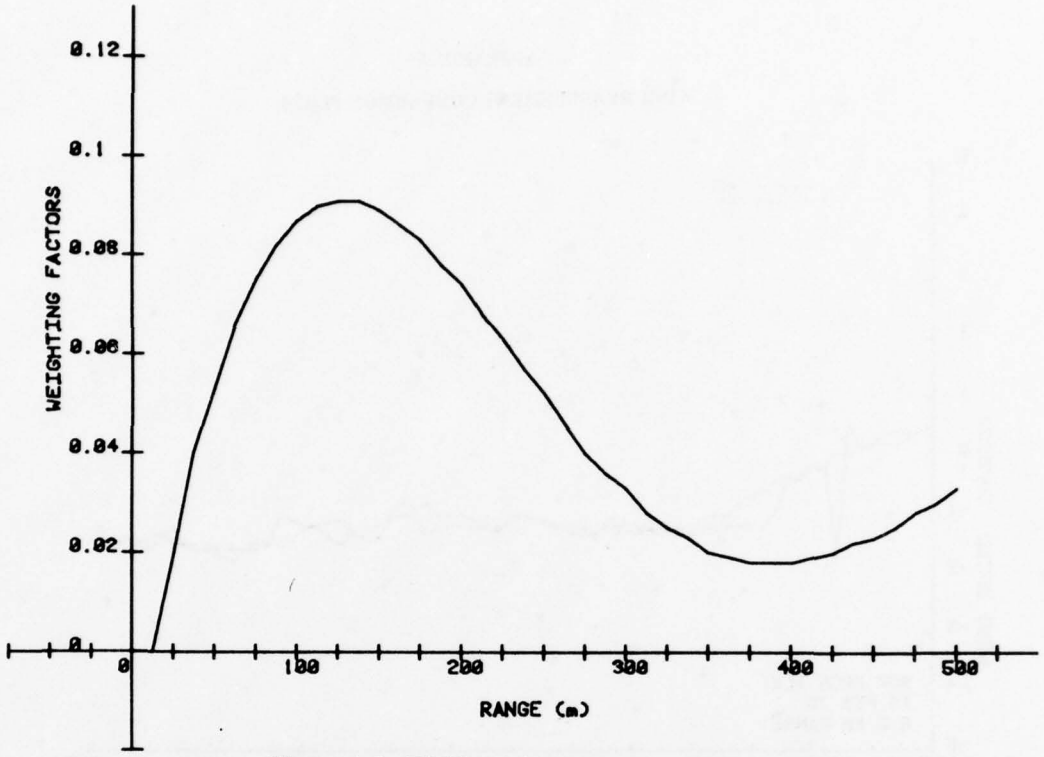

Figure A-3. PRCS weighting function (14 Feb 78).

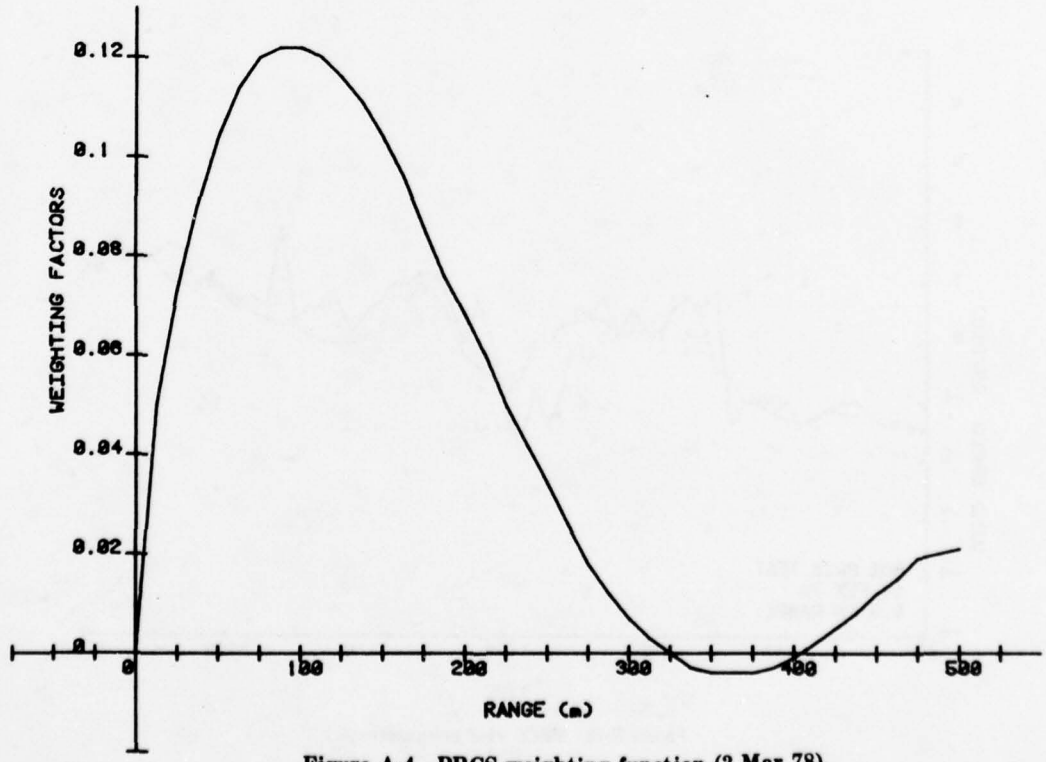

Figure A-4. PRCS weighting function (3 Mar 78).

APPENDIX B

WIND MEASUREMENT COMPARISON PLOTS

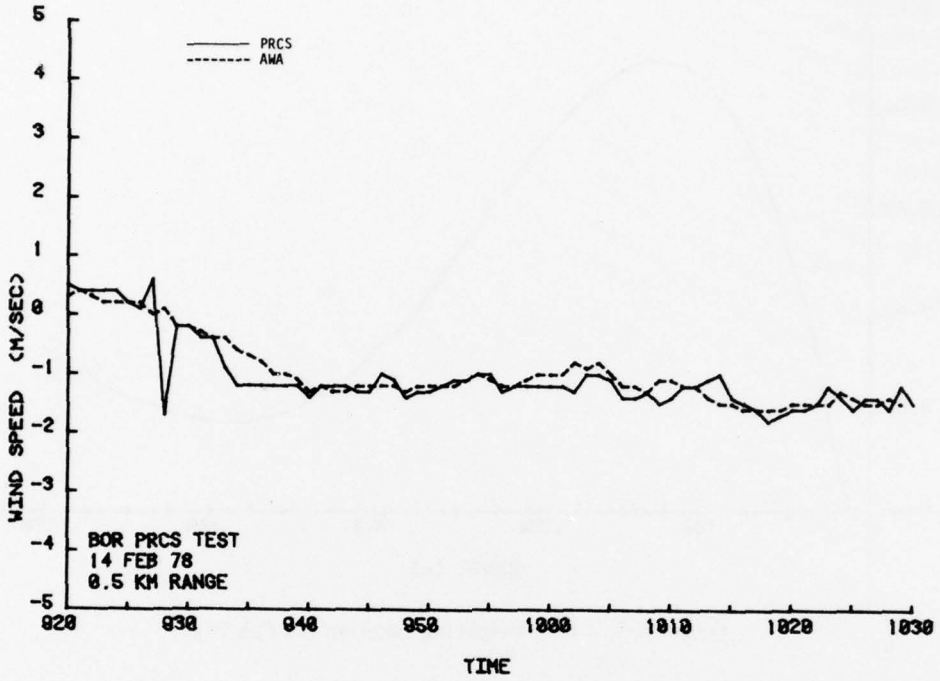

Figure B-1a. PRCS wind comparison plot.

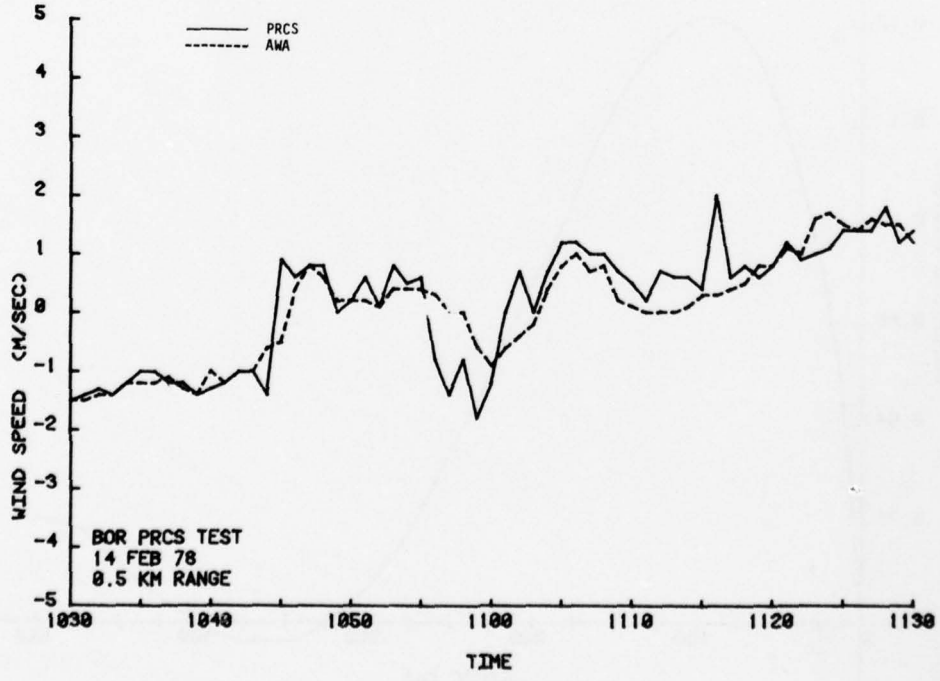

Figure B-1b. PRCS wind comparison plot.

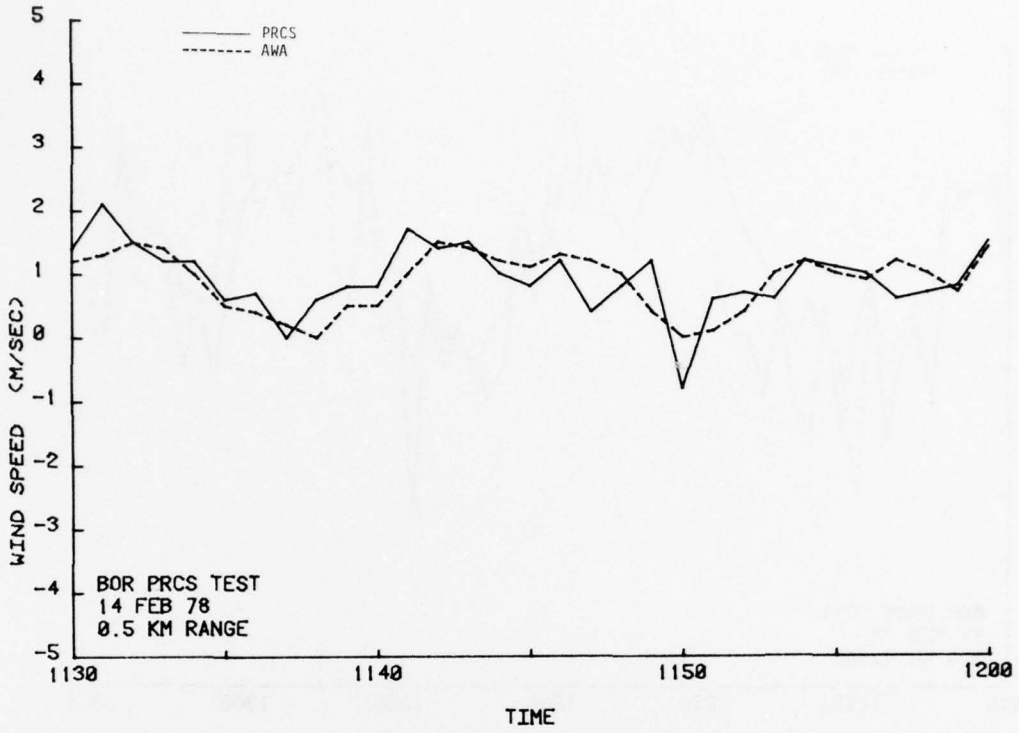

Figure B-1c. PRCS wind comparison plot.

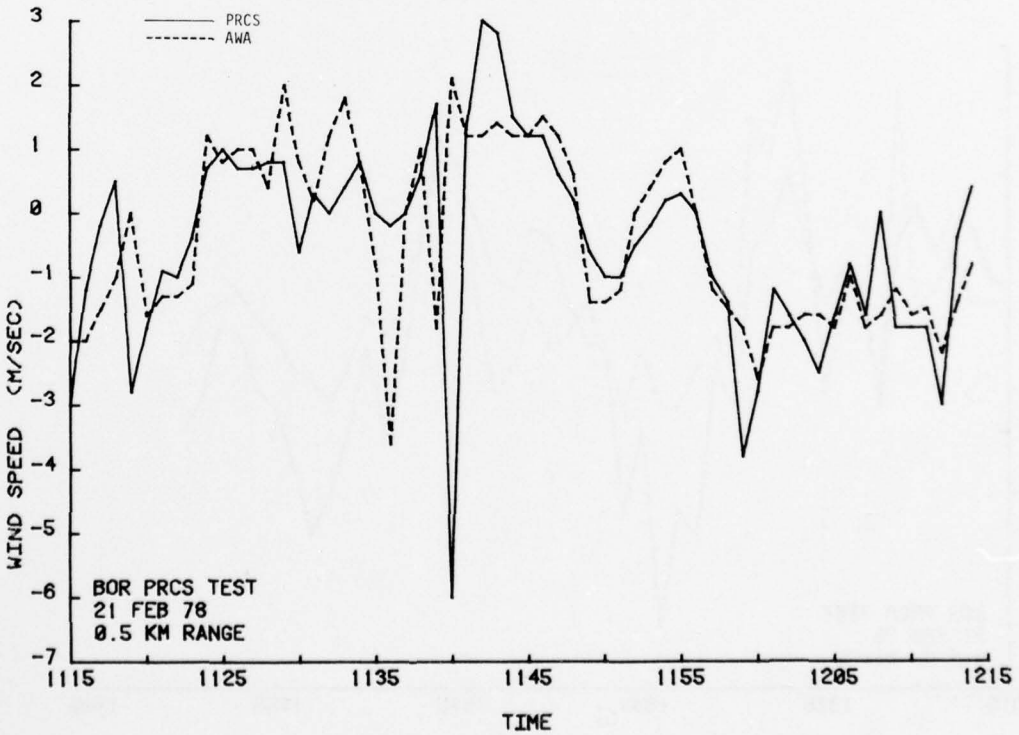

Figure B-2a. PRCS wind comparison plot.

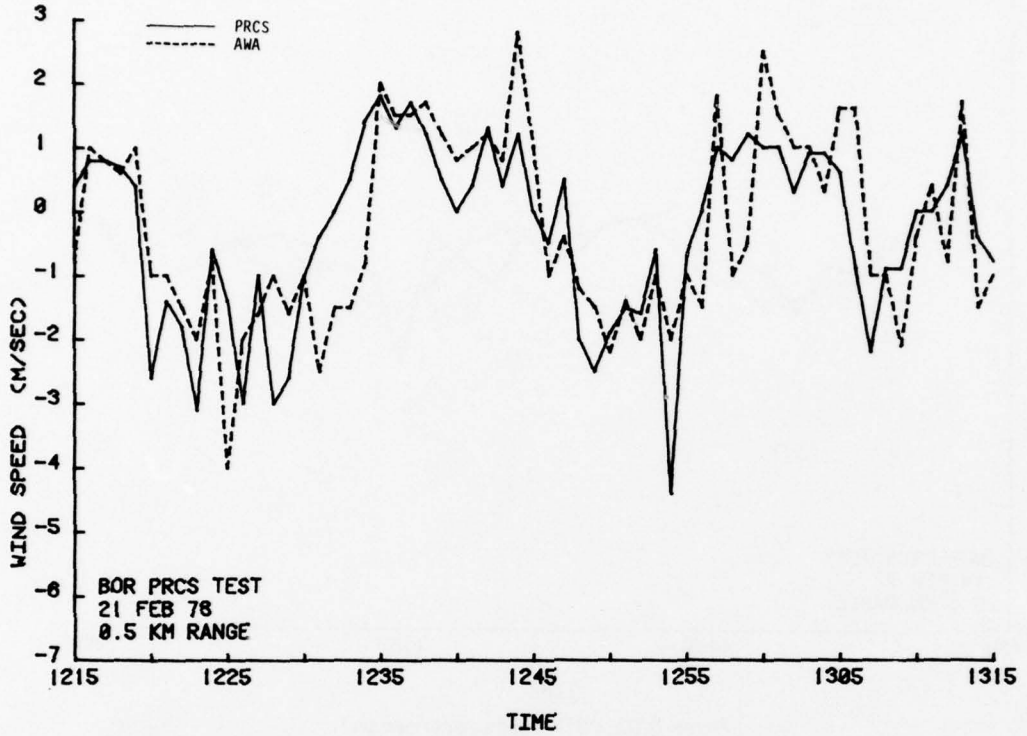

Figure B-2b. PRCS wind comparison plot.

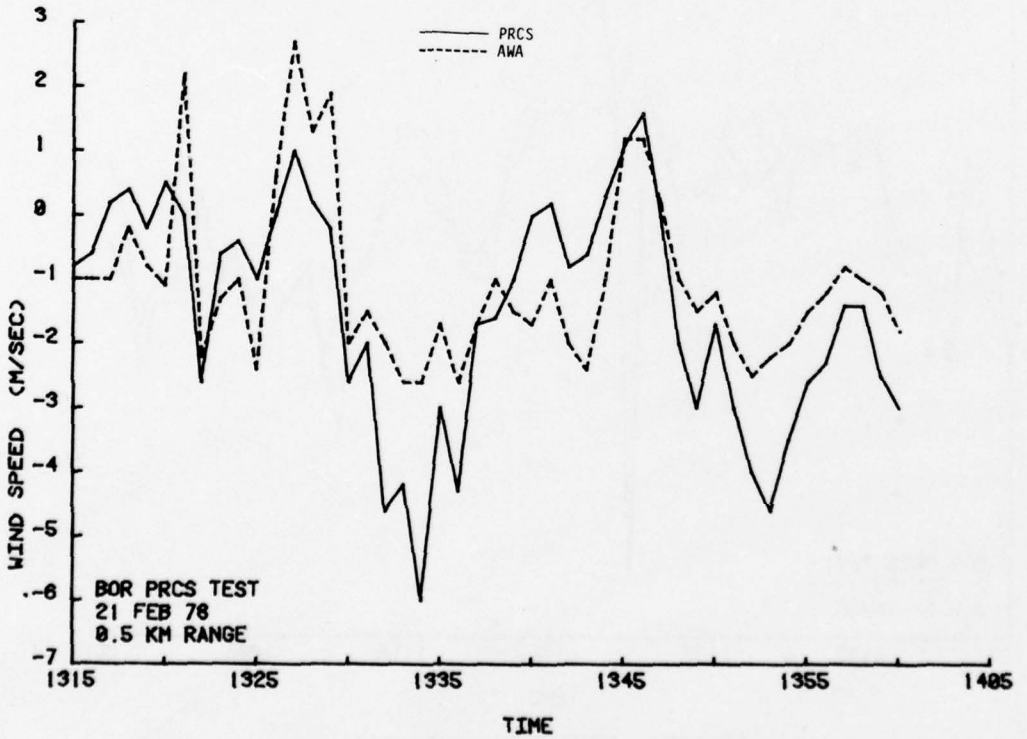

Figure B-2c. PRCS wind comparison plot.

APPENDIX C
DAILY WEATHER PARAMETERS

WS FORM F-6
(3-74)

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL WEATHER SERVICE

PRELIMINARY LOCAL CLIMATOLOGICAL DATA

STATION: El Paso, International Airport, TX

MONTH: FEBRUARY YEAR: 1978

LATITUDE: 31° 48′ N LONGITUDE: 106° 24′ W GROUND ELEVATION (Ft.): 3918 FT STANDARD TIME: MTN

DAY	TEMPERATURE °F MAXIMUM	MINIMUM	AVERAGE	DEPARTURE FROM NORMAL	DEGREE DAYS (Base 65) HEATING	COOLING	PRECIPITATION (In.) TOTAL (Water equivalent)	SNOWFALL, ICE PELLETS	SNOW, ICE PELLETS OR ICE ON GROUND AT 5AM	WIND AVERAGE SPEED (m.p.h.)	FASTEST MILE SPEED (m.p.h.)	FASTEST MILE DIRECTION	SUNSHINE TOTAL (Hrs. and tenths)	SUNSHINE PERCENT OF POSSIBLE	SUNRISE TO SUNSET (Tenths)	WEATHER OCCURRENCES	SKY MID TO MID	PK WND MPH	PK WND DIR	PK WND TIME
1	2	3	4	5	6a	6b	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	67	39	53	+7	12	0	0	0	0	5.7	13	28	626	98	3		1	24	W	1249
2	55	41	48	+2	17	0	T	0	0	5.8	9	10	571	89	4		4	17	NE	0803
3	64	37	51	+5	14	0	0	0	0	5.0	10	02	644	100	0		1	15	NE	1203
4	72	33	53	+7	12	0	0	0	0	7.2	17	04	627	97	4		4	23	NE	1649
5	63	35	49	+2	16	0	0	0	0	4.5	13	13	446	69	9		8	16	SE	1639
6	53	44	49	+2	16	0	.27	0	0	6.2	15	22	36	6	10	1	8	24	W	1833
7	62	46	54	+7	11	0	0	0	0	9.8	18	22	545	84	5		5	25	SW	0438
8	62	46	54	+7	11	0	.03	0	0	14.6	29	26	331	51	6		5	45	W	2019
9	63	37	50	+3	15	0	0	0	0	6.0	22	28	632	97	2		1	28	W	0004
10	74	37	56	+8	9	0	0	0	0	4.8	12	14	593	90	3		3	23	SW	1354
11	57	43	50	+2	15	0	.04	0	0	9.6	24	25	605	9	10		7	35	W	1248
12	51	39	45	-3	20	0	0	0	0	11.7	22	25	430	65	5		7	43	W	1418
13	53	39	46	-2	19	0	0	0	0	10.5	25	25	593	90	6		6	39	W	0457
14	53	41	47	-1	18	0	.02	0	0	10.4	21	26	367	55	7		7	40	W	2122
15	54	33	44	-4	21	0	0	0	0	7.1	21	26	593	89	2		3	29	SW	0012
16	55	35	45	-4	20	0	0	0	0	14.7	28	30	466	70	5		3	44	NW	1956
17	45	25	35	-13	30	0	0	0	0	3.2	12	01	474	71	7		4	17	N	0057
18	48	28	38	-11	27	0	0	0	0	3.4	14	25	645	96	2		1	17	N	1306
19	47	27	37	-12	28	0	0	0	0	7.6	14	02	556	83	5		4	30	NE	1411
20	57	28	43	-6	22	0	0	0	0	6.6	13	23	673	100	0		0	21	SW	0254
21	58	28	43	-7	22	0	0	0	0	3.9	7	06	675	100	0		0	13	SE	1457
22	63	29	46	-4	19	0	0	0	0	3.1	9	01	649	96	9		7	12	SW	1306
23	68	31	50	0	15	0	0	0	0	3.1	7	20	666	98	6		4	15	NE	0217
24	71	32	52	+2	13	0	0	0	0	7.7	18	29	680	100	0		0	29	NW	1702
25	73	35	54	+4	11	0	0	0	0	6.0	13	23	682	100	1		0	23	SW	1614
26	74	44	59	+8	6	0	T	0	0	8.2	17	22	3	0	10		9	30	SW	2236
27	65	50	58	+7	7	0	.06	0	0	9.9	18	24	234	34	8		8	31	SW	0002
28	73	50	62	+11	3	0	.05	0	0	9.9	16	22	310	45	8	1	9	29	SW	1340
29																				
30																				
31																				
SUM	1700	1032	—	—	449	0	.47	0	—	206.2	—	—	13807	---	137	—	119	45	W	2019
AVG	60.7	36.9	—	—	—	—	—	—	—	7.4	FASTEST	DIRECTION	POSSIBLE	%	—	—	—	—	—	—
										MISC. →	29	26	18583	74	4.9	—	4.3			

TEMPERATURE DATA

AVERAGE MONTHLY 48.8
DEPARTURE FROM NORMAL +0.4
HIGHEST 74 ON 10th, 26th
LOWEST 25 ON 17th
NUMBER OF DAYS WITH –
MAX. 32° OR BELOW 0
MAX. 90° OR ABOVE 0
MIN. 32° OR BELOW 8
MIN. 0° OR BELOW 0
HEATING DEGREE DAYS (Base 65)
TOTAL THIS MONTH 449
DEPARTURE FROM NORMAL -16
SEASONAL TOTAL 1908
DEPARTURE FROM NORMAL -353
COOLING DEGREE DAYS (Base 65°)
TOTAL THIS MONTH 0
DEPARTURE FROM NORMAL 0
SEASONAL TOTAL 0
DEPARTURE FROM NORMAL 0

PRECIPITATION DATA

TOTAL FOR THE MONTH .47 IN
DEPARTURE FROM NORMAL +.05 IN
GREATEST IN 24 HRS .27 ON 6th
SNOWFALL, ICE PELLETS
TOTAL FOR THE MONTH 0 IN
GREATEST IN 24 HRS 0 ON –
GREATEST DEPTH ON GROUND 0 ON –

WEATHER

NUMBER OF DAYS –
CLEAR (Scale 0–3) 10
PARTLY CLOUDY (Scale 4–7) 11
CLOUDY (Scale 8–10) 7
WITH 0.01 INCH OR MORE PRECIP. 6
WITH 0.10 INCH OR MORE PRECIP 1
WITH 0.50 INCH OR MORE PRECIP 0
WITH 1.00 INCH OR MORE PRECIP 0

SYMBOLS USED IN COLUMN 16

1 : FOG
2 : FOG WITH VISIBILITY ¼ MILE OR LESS
3 : THUNDER
4 : ICE PELLETS
5 : HAIL
6 : GLAZE OR RIME
7 : DUSTSTORM OR SANDSTORM
8 : SMOKE OR HAZE
9 : BLOWING SNOW
X : TORNADO

MAXIMUM PRECIPITATION

Δt (Minutes)	5	10	15	20	30	45	60	80	100	120	150	180
PRECIPITATION (Inches)	.02	.03	.04	.04	.05	.06	.08	.10	.11	.14	.16	.20
ENDED: DATE	27	06	06	06	06	06	06	06	06	06	06	06
TIME	2312	1200	1200	1200	1200	1200	1200	1220	1220	1200	1200	1300

BAROMETRIC PRESSURE
(Climatic-group station elevation)
[illegible] FT. M.S.L.
MONTHLY AVERAGE STATION [illegible] N
HIGHEST SEA-LEVEL 30.40 N ON 21st
LOWEST SEA-LEVEL 29.46 N ON 11th

WS FORM F-6
(9-74)

U. S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL WEATHER SERVICE

PRELIMINARY LOCAL CLIMATOLOGICAL DATA

STATION: El Paso, International Airport, TX

MONTH: MARCH

YEAR: 1978

LATITUDE: 31° 48' N

LONGITUDE: 106° 24' W

GROUND ELEVATION (Ft): 3918 FT

STANDARD TIME: MTN

DAY	TEMPERATURE °F MAXIMUM	MINIMUM	AVERAGE	DEPARTURE FROM NORMAL	DEGREE DAYS (Base 65°) HEATING	COOLING	PRECIPITATION (In.) TOTAL (Water equivalent)	SNOWFALL, ICE PELLETS	SNOW, ICE PELLETS OR ICE ON GROUND AT 5AM	WIND AVERAGE SPEED (m.p.h.)	FASTEST MILE SPEED (m.p.h.)	FASTEST MILE DIRECTION	SUNSHINE TOTAL (Hrs. and tenths)	SUNSHINE PERCENT OF POSSIBLE	SKY COVER SUNRISE TO SUNSET (Tenths)	WEATHER OCCURRENCES	SKY MID TO MID	PK WND MPH	PK WND DIR	PK WND TIME
1	68	52	60	+9	5	0	.07	0	0	12.2	30	25	153	22	9		8	49	W	2054
2	70	52	61	+10	4	0	T	0	0	12.8	30	23	330	48	8		7	41	SW	0156
3	70	52	61	+10	4	0	0	0	0	18.5	29	28	601	87	5		4	41	SW	1031
4	67	33	50	-2	15	0	0	0	0	7.8	14	20	667	96	4		2	18	W	0348
5	77	51	64	+12	1	0	T	0	0	14.3	29	26	528	76	8		6	49	SW	2302
6	65	47	56	+4	9	0	T	T*	0	13.4	23	23	483	69	8	5	7	37	SW	0113
7	55	35	45	-7	20	0	T	0	0	6.0	27	28	285	41	7		5	30	W	0001
8	69	30	50	-2	15	0	0	0	0	6.0	15	24	704	100	0		0	21	SW	1021
9	77	37	57	+4	8	0	0	0	0	7.0	15	23	684	97	2		2	23	SW	0133
10	68	47	58	+5	7	0	0	0	0	18.6	35	26	666	94	3		2	62	SW	1258
11	66	44	55	+2	10	0	0	0	0	10.3	21	29	710	100	0		0	32	W	0016
12	65	35	50	-3	15	0	T	0	0	12.4	29	26	410	58	6		5	46	SW	1807
13	59	42	51	-3	14	0	0	0	0	17.2	25	27	540	76	4		4	40	W	2154
14	65	40	53	-1	12	0	0	0	0	15.1	23	27	716	100	0		0	35	W	1925
15																				
16																				
17																				
18																				
19																				
20																				
21																				
22																				
23																				
24																				
25																				
26																				
27																				
28																				
29																				
30																				
31																				
SUM			—	—																
AVG			—	—	—	—	—	—	—		FASTEST	DIRECTION	POSSIBLE	%						

MISC. →

TEMPERATURE DATA

AVERAGE MONTHLY _____

DEPARTURE FROM NORMAL _____

HIGHEST _____ ON _____

LOWEST _____ ON _____

NUMBER OF DAYS WITH –

MAX. 32° OR BELOW _____

MAX. 90° OR ABOVE _____

MIN. 32° OR BELOW _____

MIN. 0° OR BELOW _____

HEATING DEGREE DAYS (Base 65°)

TOTAL THIS MONTH _____

DEPARTURE FROM NORMAL _____

SEASONAL TOTAL _____

DEPARTURE FROM NORMAL _____

COOLING DEGREE DAYS (Base 65°)

TOTAL THIS MONTH _____

DEPARTURE FROM NORMAL _____

SEASONAL TOTAL _____

DEPARTURE FROM NORMAL _____

PRECIPITATION DATA

TOTAL FOR THE MONTH _____ IN.

DEPARTURE FROM NORMAL _____ IN.

GREATEST IN 24 HRS. _____ ON _____

SNOWFALL, ICE PELLETS

TOTAL FOR THE MONTH _____ IN.

GREATEST IN 24 HRS. _____ ON _____

GREATEST DEPTH ON GROUND _____ ON _____

WEATHER

NUMBER OF DAYS –

CLEAR (Scale 0–3) _____

PARTLY CLOUDY (Scale 4–7) _____

CLOUDY (Scale 8–10) _____

WITH 0.01 INCH OR MORE PRECIP. _____

WITH 0.10 INCH OR MORE PRECIP. _____

WITH 0.50 INCH OR MORE PRECIP. _____

WITH 1.00 INCH OR MORE PRECIP. _____

SYMBOLS USED IN COLUMN 16

1 = FOG

2 = FOG WITH VISIBILITY ¼ MILE OR LESS

3 = THUNDER

4 = ICE PELLETS

5 = HAIL

6 = GLAZE OR RIME

7 = DUSTSTORM OR SANDSTORM

8 = SMOKE OR HAZE

9 = BLOWING SNOW

X = TORNADO

MAXIMUM PRECIPITATION

Δt (Minutes)	5	10	15	20	30	45	60	80	100	120	150	180
PRECIPITATION (In. hrs)												
ENDED DATE												
TIME												

BAROMETRIC PRESSURE
(Climatological station elevation)

HIGH: _____ FT. M.S.L.

MONTHLY AVERAGE STATION _____ IN.

HIGHEST SEA-LEVEL _____ IN. ON _____

LOWEST SEA-LEVEL _____ IN. ON _____

*T-Hail

APPENDIX D

FORTRAN IV DATA PLOT PROGRAMS

```
$WLTRC T=00004 IS ON CR00002 USING 00019 BLKS R=0146

0001   FTN4,L,T
0002         PROGRAM WLTRC,3
0003   C*************************************************************
0004   C      WLTRC IS USED TO LOAD COMMON WITH THE DESIRED
0005   C      PARAMETERS FOR REAL TIME ANALYSIS WITH WLTR1.
0006   C*************************************************************
0007         COMMON F,S(94),IT(6)
0008         COMMON A3(3,3),B3(3)
0009         COMMON A4(4,4),B4(4)
0010         COMMON A5(5,5),B5(5)
0011         COMMON A7(7,7),B7(7)
0012         COMMON A10(10,10),B10(10)
0013         COMMON P,MN,IS,IMT,MS,MAVG
0014         COMMON SN,SX,SY,SYX,SXX,XC,YC,DA,DS
0015         COMMON WT(21),IARRY
0016         COMMON SUMB(5),BALL(29)
0017         COMMON IW1,IW2,IW3,IW4,IW5,IW9,IWZ
0018         COMMON F9,S9(94)
0019         DIMENSION IP(5)
0020         CALL RMPAR(IP)
0021         LU1=IP(1)
0022         LU2=IP(2)
0023         LU3=IP(3)
0024         LP=IP(4)
0025         IF(LU1.EQ.0)LU1=1
0026         IF(LU2.EQ.0)LU2=1
0027         IF(LU3.EQ.0)LU3=1
0028         IF(LP.EQ.0)LP=1
0029   C     ZERO OUT ARRAYS
0030         DO 1 I=1,10
0031         DO 1 J=1,10
0032         A10(I,J)=0.0
0033         B10(I)=0.0
0034         IF(I.GT.7.OR.J.GT.7)GO TO 1
0035         A7(I,J)=0.0
0036         B7(I)=0.0
0037         IF(I.GT.5.OR.J.GT.5)GO TO 1
0038         A5(I,J)=0.0
0039         B5(I)=0.0
0040         IF(I.GT.4.OR.J.GT.4)GO TO 1
0041         A4(I,J)=0.0
0042         B4(I)=0.0
0043         IF(I.GT.3.OR.J.GT.3)GO TO 1
0044         A3(I,J)=0.0
0045         B3(I)=0.0
0046   1     CONTINUE
0047   C     ZERO SUMS FOR WLTR1
```

```
0048          P=0.0
0049          DA=0.0
0050          DS=0.0
0051          SN=0.0
0052          SX=0.0
0053          SY=0.0
0054          SYX=0.0
0055          SXX=0.0
0056    C     GET CALIBRATION AND WEIGHTS FOR WLTR1
0057          IF(LP.NE.1)WRITE(LP,199)
0058    199   FORMAT(1H1,2X,"CALIBRATION FACTORS FOR REAL TIME ANALYSIS
0059         *1H0,2X,"WEIGHTS FOR ANEMOMETERS ARE"/)
0060          IF(LU1.EQ.1)WRITE(1,99)
0061    99    FORMAT("INPUT WEIGHTS"/)
0062          DO 2 I=1,21
0063          IF(LU1.EQ.1)WRITE(1,98)I
0064          READ(LU1,*)WT(I)
0065          IF(LP.NE.1)WRITE(LP,198)I,WT(I)
0066    2     CONTINUE
0067    98    FORMAT(I2,3X,"_")
0068    198   FORMAT(1H ,I2,F10.5)
0069          IF(LU2.EQ.1)WRITE(1,97)
0070    97    FORMAT("INPUT XCAL, YCAL",3X,"_")
0071          READ(LU2,*)XC,YC
0072          IF(LP.NE.1)WRITE(LP,197)XC,YC
0073    197   FORMAT(1H0,2X,"XCAL,YCAL ARE",F10.7,",",F10.7)
0074          IF(LU2.EQ.1)WRITE(1,96)
0075    96    FORMAT("INPUT # OF SENSOR",3X,"_")
0076          READ(LU2,*)IS
0077          IF(LP.NE.1)WRITE(LP,196)IS
0078    196   FORMAT(1H0,2X,"SENSOR #",I4)
0079          IF(LU2.EQ.1)WRITE(1,95)
0080    95    FORMAT("INPUT TIME INTERVAL IN MINUTES FOR WLTR3",3X,"_")
0081          READ(LU2,*)MN
0082          IF(LP.NE.1)WRITE(LP,195)MN
0083    195   FORMAT(1H0,2X,"LEAST SQUARES READOUT EVERY",I3," MINUTES"
0084          IF(LU2.EQ.1)WRITE(1,94)
0085    94    FORMAT("INPUT MINUTES FOR AVERAGES",3X,"_")
0086          READ(LU2,*)MAVG
0087          IF(LP.NE.1)WRITE(LP,194)MAVG
0088    194   FORMAT(1H0,2X,"AVERAGES REPORTED EVERY",I3," MINUTES")
0089    C     DETERMINE IF .5K OR 2K WANTED.
0090          IF(LU2.EQ.1)WRITE(1,93)
0091    93    FORMAT("ENTER 0 FOR .5K OR 2 FOR 2K",3X,"_")
0092          READ(LU2,*)IARRY
0093          IF(IARRY.EQ.0)WRITE(LP,193)
0094          IF(IARRY.EQ.2)WRITE(LP,200)
0095    193   FORMAT(1H0,2X,"ANALYSIS FOR THE 1/2 K ARRAY")
0096    200   FORMAT(1H0,2X,"ANALYSIS FOR THE   2 K ARRAY")
0097          IF(LU3.EQ.1)WRITE(1,92)
0098    92    FORMAT("INPUT 0 OR 1 FOR SUBS DESIRED"/
0099         *"OR TO DESIGNATE OTHER PARAMETERS")
0100          IF(LP.NE.1)WRITE(LP,192)
```

```
0101   192    FORMAT(1H0,2X,"SUBS DESIRED OR OTHER PARAMETERS")
0102   91     FORMAT("IW1",3X,"_")
0103   90     FORMAT("IW2",3X,"_")
0104   89     FORMAT("IW3",3X,"_")
0105   88     FORMAT("IW4",3X,"_")
0106   87     FORMAT("IW5",3X,"_")
0107   86     FORMAT("IW9",3X,"_")
0108   191    FORMAT(1H ,2X,"IW1",I5)
0109   190    FORMAT(1H ,2X,"IW2",I5)
0110   189    FORMAT(1H ,2X,"IW3",I5)
0111   188    FORMAT(1H ,2X,"IW4",I5)
0112   187    FORMAT(1H ,2X,"IW5",I5)
0113   186    FORMAT(1H ,2X,"IW9",I5)
0114          IF(LU3.EQ.1)WRITE(1,91)
0115          READ(LU3,*)IW1
0116          IF(LP.NE.1)WRITE(LP,191)IW1
0117          IF(LU3.EQ.1)WRITE(1,90)
0118          READ(LU3,*)IW2
0119          IF(LP.NE.1)WRITE(LP,190)IW2
0120          IF(LU3.EQ.1)WRITE(1,89)
0121          READ(LU3,*)IW3
0122          IF(LP.NE.1)WRITE(LP,189)IW3
0123          IF(LU3.EQ.1)WRITE(1,88)
0124          READ(LU3,*)IW4
0125          IF(LP.NE.1)WRITE(LP,188)IW4
0126          IF(LU3.EQ.1)WRITE(1,87)
0127          READ(LU3,*)IW5
0128          IF(LP.NE.1)WRITE(LP,187)IW5
0129          IF(LU3.EQ.1)WRITE(1,86)
0130          READ(LU3,*)IW9
0131          IF(LP.NE.1)WRITE(LP,186)IW9
0132          WRITE(1,85)
0133   85     FORMAT("ENTER FILE # ON TAPE",3X,"_")
0134          READ(1,*)IWZ
0135          IF(LP.NE.1)WRITE(LP,185)IWZ
0136   185    FORMAT(1H0,2X,"TAPE FILE #",I2)
0137          WRITE(1,84)
0138   84     FORMAT("INPUT TIME INTERVAL IN SECONDS",3X,"_")
0139          READ(1,*)MS
0140          IF(LP.NE.1)WRITE(LP,184)MS
0141   184    FORMAT(1H0,2X,"AVERAGING TIME IS",I3," SECONDS")
0142          WRITE(1,83)
0143   83     FORMAT(/"THAT'S ALL, THANKS")
0144          STOP
0145          END
0146          END$
```

```
$WLTRR T=00004 IS ON CR00002 USING 00011 BLKS R=0082

0001   FTN4,L,T
0002         PROGRAM WLTRR,3
0003   C*************************************************
0004   C      WLTRR IS A PROGRAM FOR REAL TIME ANALYSIS OF THE'
0005   C      WEIGHTING FACTORS OF VARIOUS SENSORS.  IT IS CALLED
0006   C      BY MOMSA.  WLTRC MUST FIRST BE CALLED TO SET UP
0007   C      PARAMETERS.  SOME OF THE PARAMETERS CALLED FOR MAY
0008   C      NOT PERTAIN TO WLTRR, BUT MUST BE ANSWERED.  THE
0009   C      SCHEDULING TIME IN SECONDS IS SET IN MOMSA, BUT THE
0010   C      SAME INFORMATION SHOULD BE ENTERED IN WLTRC FOR THE
0011   C      PRINTOUT.
0012   C*************************************************/
0013         COMMON F,S(94),IT(6)
0014         COMMON A3(3,3),B3(3)
0015         COMMON A4(4,4),B4(4)
0016         COMMON A5(5,5),B5(5)
0017         COMMON A7(7,7),B7(7)
0018         COMMON A10(10,10),B10(10)
0019         COMMON P,MN,IS,IMT,MS,MAVG
0020         COMMON SN,SX,SY,SYX,SXX,XC,YC,DA,DS
0021         COMMON WT(21),IARRY
0022         COMMON SUMB(5),BALL(29)
0023         COMMON IW1,IW2,IW3,IW4,IW5,IW9,IWZ
0024         COMMON F9,S9(94)
0025         DIMENSION NW4(3),MON(2)
0026         DATA NW4/2HWL,2HTR,2H4 /
0027   C     ENTER HERE ON CONTINUATION.
0028   C     CHECK TO SEE IF ANALYSIS TERMINATED.
0029         IF(IMT.GT.1)GO TO 69
0030   C     IF FIRST TIME THROUGH, PRINT TIME ON LINE PRINTER.
0031   C     AND ZERO AVERAGES.
0032         IF(P.GT.0.0)GO TO 2
0033         IDAY=IT(5)
0034         IY=IT(6)
0035         CALL DATE(IDAY,MON,IY)
0036         WRITE(6,99)IS,MS,IT(4),IT(3),IT(2),IDAY,MON,IY
0037   99    FORMAT(1H1,"REAL TIME ANALYSIS OF CH #",I3/
0038        *1H ,"WITH ",I2," SECOND AVERAGE"/
0039        *"FOR DATA BEGINNING",I3,":",I2,":",I2," ON",I3,1X,2A2,I4//)
0040         F9=0.0
0041         DO 1 I=1,94
0042   1     S9(I)=0.0
0043   C     DRAW GRID FOR LINEARITY PLOT.
0044         IF(IW1.EQ.0.AND.IW2.EQ.0)GO TO 2
0045         CALL WLTR5
0046   2     CONTINUE
0047   C     SUM FOR AVERAGES
0048         IF(IW9.EQ.0)GO TO 3
0049         CALL WLTR9
0050   3     CONTINUE
0051   C     CHECK FOR .5K OR 2K RANGE.
0052         IF(IARRY.EQ.0)GO TO 6
0053         K=0
0054         DO 4 I=1,21,4
0055         K=K+1
0056   4     S(K)=S(I)
0057         DO 5 I=22,36
0058         K=K+1
```

```
0059   5      S(K)=S(I)
0060   6      CONTINUE
0061   C      SUM ALL POINTS.
0062          P=P+F
0063   C      CALL LINEARITY PLOT.
0064          IF(IW1.EQ.0)GO TO 7
0065          CALL WLTR1
0066   7      CONTINUE
0067   C      CHECK SWITCH REGISTER FOR TERMINATION.
0068          ISW=ISSW(15)
0069          IF(ISW.NE.0)GO TO 68
0070   C      LOAD UP ARRAYS FOR FIT TO WEIGHTING FACTORS.
0071          IF(IW2.EQ.0)GO TO 69
0072          CALL WLTR2
0073   C      IF ITS TIME, PRINT OUT PRESENT WEIGHTING FACTORS.
0074          MO=MOD(IT(3),MN)
0075          IF(MO.NE.0)GO TO 69
0076          IF(IT(2).NE.0)GO TO 69
0077          CALL WLTR3
0078          GO TO 69
0079   C      TERMINATION SEQUENCE
0080   68     CONTINUE
0081          IMT=69
0082          CALL WLTR5
0083          CALL WLTR3
0084          CALL EXEC(9,NW4)
0085   69     CONTINUE
0086          CALL EXEC(6,0,-1)
0087          END
0088          END$
```

```
SWLTR1 T=00004 IS ON CR00002 USING 00006 BLKS R=0045

0001   FTN4,L,T
0002         SUBROUTINE WLTR1
0003   C*****************************************************************
0004   C      WLTR1 IS A SUBROUTINE OF WLTRR.  IT IS USED TO PLOT
0005   C      THE CORRELATION OF THE WEIGHTED AVERAGE OF THE
0006   C      ANEMOMETERS AND A SENSOR, AND COMPUTE CORRELATION.
0007   C*****************************************************************
0008         COMMON F,S(94),IT(6)
0009         COMMON A3(3,3),B3(3)
0010         COMMON A4(4,4),B4(4)
0011         COMMON A5(5,5),B5(5)
0012         COMMON A7(7,7),B7(7)
0013         COMMON A10(10,10),B10(10)
0014         COMMON P,MN,IS,IMT,MS,MAVG
0015         COMMON SN,SX,SY,SYX,SXX,XC,YC,DA,DS
0016         COMMON WT(21),IARRY
0017         COMMON SUMB(5),BALL(29)
0018         COMMON IW1,IW2,IW3,IW4,IW5,IW9,IWZ
0019         COMMON F9,S9(94)
0020         CALL PLTLU(10)
0021         CALL SFACT(15.,10.)
0022         Y=S(IS)*YC/F
0023         X=0.0
0024         DO 1 I=1,21
0025         X=X+S(I)*WT(I)*XC/F
0026   1     CONTINUE
0027         SN=SN+1.0
0028         D=(Y-X)/10
0029         DA=DA+D
0030         DS=DS+D*D
0031         SX=SX+X
0032         SY=SY+Y
0033         SYX=SYX+Y*X
0034         SXX=SXX+X*X
0035         Z=ABS(X)
0036         IF(Z.GE.4.75)X=4.75*X/Z
0037         IX=(X*1000.+5000.)*2./3.
0038         Z=ABS(Y)
0039         IF(Z.GE.4.75)Y=4.75*Y/Z
0040         IY=Y*1000.+5000.
0041         CALL PLT(0,0.1,IX,IY)
0042   69    CONTINUE
0043         RETURN
0044         END
0045         END$
```

```
SWLTR2 T=00004  IS ON CR00002 USING 00009 BLKS R=0078

0001   FTN4,L,T
0002         SUBROUTINE WLTR2
0003   C*************************************************************
0004   C      WLTR2 IS A SUBROUTINE OF WLTRR.  IT IS USED TO LOAD THE
0005   C      ARRAYS FOR A LEAST SQUARES FIT FOR WEIGHTING FACTORS.
0006   C*************************************************************
0007         COMMON F,S(94),IT(6)
0008         COMMON A3(3,3),B3(3)
0009         COMMON A4(4,4),B4(4)
0010         COMMON A5(5,5),B5(5)
0011         COMMON A7(7,7),B7(7)
0012         COMMON A10(10,10),B10(10)
0013         COMMON P,MN,IS,IMT,MS,MAVG
0014         COMMON SN,SX,SY,SYX,SXX,XC,YC,DA,DS
0015         COMMON WT(21),IARRY
0016         COMMON SUMB(5),BALL(29)
0017         COMMON IW1,IW2,IW3,IW4,IW5,IW9,IWZ
0018         COMMON F9,S9(94)
0019         DIMENSION T(22),D(10)
0020         DO 1 I=1,21
0021   1     T(I)=S(I)*XC/F
0022         T(22)=S(IS)*YC/F
0023         DO 3 J=1,3
0024         D(J)=0.0
0025         DO 2 K=1,7
0026         L=(J-1)*7+K
0027   2     D(J)=D(J)+T(L)
0028         D(J)=D(J)/7.
0029         B3(J)=B3(J)+T(22)*D(J)
0030         DO 3 I=1,J
0031         A3(I,J)=A3(I,J)+D(I)*D(J)
0032   3     CONTINUE
0033         DO 5 J=1,4
0034         D(J)=0.0
0035         DO 4 K=1,5
0036         L=(J-1)*5+K
0037   4     D(J)=D(J)+T(L)
0038         D(J)=D(J)/5.
0039         B4(J)=B4(J)+T(22)*D(J)
0040         DO 5 I=1,J
0041         A4(I,J)=A4(I,J)+D(I)*D(J)
0042   5     CONTINUE
0043         DO 7 J=1,5
0044         D(J)=0.0
0045         DO 6 K=1,4
0046         L=(J-1)*4+K
0047   6     D(J)=D(J)+T(L)
0048         D(J)=D(J)/4.
0049         B5(J)=B5(J)+T(22)*D(J)
0050         DO 7 I=1,J
0051         A5(I,J)=A5(I,J)+D(I)*D(J)
0052   7     CONTINUE
0053         DO 9 J=1,7
0054         D(J)=0.0
0055         DO 8 K=1,3
0056         L=(J-1)*3+K
0057   8     D(J)=D(J)+T(L)
0058         D(J)=D(J)/3.
```

```
0059          B7(J)=B7(J)+T(22)*D(J)
0060          DO 9 I=1,J
0061          A7(I,J)=A7(I,J)+D(I)*D(J)
0062    9     CONTINUE
0063          DO 11 J=1,10
0064          D(J)=0.0
0065          DO 10 K=1,2
0066          L=(J-1)*2+K
0067    10    D(J)=D(J)+T(L)
0068          D(J)=D(J)/2.
0069          B10(J)=B10(J)+T(22)*D(J)
0070          DO 11 I=1,J
0071          A10(I,J)=A10(I,J)+D(I)*D(J)
0072    11    CONTINUE
0073    69    CONTINUE
0074          RETURN
0075          END
0076          END$
```

```
$WLTR3 T=00004 IS ON CR00002 USING 00012 BLKS R=0112

0001   FTN4,L,T
0002         SUBROUTINE WLTR3
0003   C*****************************************************************
0004   C      WLTR3 IS CALLED BY WLTRR FOR REAL TIME ANALYSIS
0005   C      IT COMPUTES THE LEAST SQUARES FITS FOR THE WEIGHTING
0006   C      FACTORS, AND SAVES THEM FOR WLTR4
0007   C*****************************************************************
0008         COMMON F,S(94),IT(6)
0009         COMMON A3(3,3),B3(3)
0010         COMMON A4(4,4),B4(4)
0011         COMMON A5(5,5),B5(5)
0012         COMMON A7(7,7),B7(7)
0013         COMMON A10(10,10),B10(10)
0014         COMMON P,MN,IS,IMT,MS,MAVG
0015         COMMON SN,SX,SY,SYX,SXX,XC,YC,DA,DS
0016         COMMON WT(21),IARRY
0017         COMMON SUMB(5),BALL(29)
0018         COMMON IW1,IW2,IW3,IW4,IW5,IW9,IWZ
0019         COMMON F9,S9(94)
0020         DIMENSION A(10,10),B(10)
0021         WRITE(6,99)IT(4),IT(3),IT(2),IT(1),P
0022   99    FORMAT(//" AT",I3,":",I2,":",I2,".",I2," WITH",F9 0," POINTS )
0023         DO 67 I=1,5
0024   67    SUMB(I)=0.0
0025         ISUMB=0
0026         IBALL=0
0027         DO 69 L=1,5
0028         GO TO (1,3,5,7,9),L
0029   1     M=3
0030         DO 2 J=1,3
0031         B(J)=B3(J)
0032         DO 2 I=1,J
0033         A(I,J)=A3(I,J)
0034   2     A(J,I)=A3(I,J)
0035         GO TO 11
0036   3     M=4
0037         DO 4 J=1,4
0038         B(J)=B4(J)
0039         DO 4 I=1,J
0040         A(I,J)=A4(I,J)
0041   4     A(J,I)=A4(I,J)
0042         GO TO 11
0043   5     M=5
0044         DO 6 J=1,5
0045         B(J)=B5(J)
0046         DO 6 I=1,J
0047         A(I,J)=A5(I,J)
0048   6     A(J,I)=A5(I,J)
0049         GO TO 11
0050   7     M=7
0051         DO 8 J=1,7
0052         B(J)=B7(J)
0053         DO 8 I=1,J
0054         A(I,J)=A7(I,J)
0055   8     A(J,I)=A7(I,J)
0056         GO TO 11
0057   9     M=10
0058         DO 10 J=1,10
```

```
0059          B(J)=B10(J)
0060          DO 10 I=1,J
0061          A(I,J)=A10(I,J)
0062    10    A(J,I)=A10(I,J)
0063    11    CONTINUE
0064          ISUMB=ISUMB+1
0065          A11=A(1,1)
0066          IF(A11.EQ.0.0)GO TO 68
0067          DO 12 I=2,M
0068    12    A(1,I)=A(I,1)/A11
0069          B(1)=B(1)/A11
0070          DO 16 J=2,M
0071          J1=J-1
0072          DO 14 I=J,M
0073          AS=0.0
0074          DO 13 K=1,J1
0075    13    AS=AS+A(I,K)*A(K,J)
0076          A(I,J)=A(I,J)-AS
0077          IF(I.GT.J)A(J,I)=A(I,J)/A(J,J)
0078    14    CONTINUE
0079          BS=0.0
0080          DO 15 K=1,J1
0081    15    BS=BS+A(J,K)*B(K)
0082          AJJ=A(J,J)
0083          IF(AJJ.EQ.0.0)GO TO 68
0084    16    B(J)=(B(J)-BS)/AJJ
0085          M1=M-1
0086          DO 18 I=1,M1
0087          BS=0.0
0088          MI=M-I
0089          MI1=MI+1
0090          DO 17 J=MI1,M
0091    17    BS=BS+A(MI,J)*B(J)
0092          B(MI)=B(MI)-BS
0093    18    CONTINUE
0094          WRITE(6,98)M,(B(I),I=1,M)
0095    98    FORMAT(/" FOR M OF",I3/
0096         *1H ,10F6.3)
0097          DO 19 ISUM=1,M
0098          IBALL=IBALL+1
0099          SUMB(ISUMB)=SUMB(ISUMB)+B(ISUM)
0100          BALL(IBALL)=B(ISUM)
0101    19    CONTINUE
0102          WRITE(6,97)SUMB(ISUMB)
0103    97    FORMAT(1H ,"SUM OF WEIGHTS =",F8.5)
0104          GO TO 69
0105    68    CONTINUE
0106          IBALL=IBALL+M
0107          WRITE(6,96)M
0108    96    FORMAT(/" FOR M OF",I3," MATRIX IS SINGULAR")
0109    69    CONTINUE
0110          RETURN
0111          END
0112          END$
```

```
SWLTR5 T=00004 IS ON CR00002 USING 00013 BLKS R=0105

0001   FTN4,L,T
0002         SUBROUTINE WLTR5
0003   C*****************************************************************
0004   C      WLTR5 IS USED TO DRAW THE GRIDS AND OTHER INFORMATION
0005   C      ON THE PLOT FOR WLTRR.
0006   C*****************************************************************
0007         COMMON F,S(94),IT(6)
0008         COMMON A3(3,3),B3(3)
0009         COMMON A4(4,4),B4(4)
0010         COMMON A5(5,5),B5(5)
0011         COMMON A7(7,7),B7(7)
0012         COMMON A10(10,10),B10(10)
0013         COMMON P,MN,IS,IMT,MS,MAVG
0014         COMMON SN,SX,SY,SYX,SXX,XC,YC,DA,DS
0015         COMMON WT(21),IARRY
0016         COMMON SUMB(5),BALL(29)
0017         COMMON IW1,IW2,IW3,IW4,IW5,IW9,IWZ
0018         COMMON F9,S9(94)
0019         DIMENSION NA(2),NS(2),NP(2),NFS(2),NFL(2)
0020         DIMENSION MON(2),NCH(2),NSEC(2)
0021         DIMENSION NAME(9)
0022         DATA NAME/2HWE,2HIG,2HHT,2HIN,2HG ,2HFA,2HCT,2HOR,2HS /
0023         DATA NA/2HAV,2HG=/,NS/2HSD,2HV=/
0024         DATA NP/2H#P,2HTS/
0025         DATA NFL/2HFI,2HLE/,NFS/2HFS,2H= /
0026         DATA NSEC/2HSE,2HC /
0027         DATA NCH/2HCH,2H# /
0028         NY=54475B
0029         NX=54053B
0030         CALL PLTLU(10)
0031         CALL SFACT(15.,10.)
0032         CALL LLEFT
0033         CALL PLOT(0.0,0.0,-1)
0034         IF(IW1.EQ.0)GO TO 5
0035         CALL PLOT(0.5,5.0,3)
0036         CALL PLOT(9.5,5.0,2)
0037         CALL PLOT(5.0,0.5,3)
0038         CALL PLOT(5.0,9.5,2)
0039         CALL DASH(0.5,0.5,0.5,0.5,-1)
0040         CALL DASH(0.5,0.5,9.5,9.5,1)
0041         IF(IW5.LE.1)GO TO 69
0042         D=SX*SX-SN*SXX
0043         A=(SX*SY-SN*SYX)/D
0044         B=(SX*SYX-SY*SXX)/D
0045         X=-4.0
0046   1     CONTINUE
0047         Y=A*X+B
0048         Z=ABS(Y)
0049         IF(Z.LE.4.75)GO TO 2
0050         X=X+.5
0051         GO TO 1
0052   2     CONTINUE
0053         X=X+5.
0054         Y=Y+5.
0055         CALL PLOT(X,Y,3)
0056         X=4.0
0057   3     CONTINUE
0058         Y=A*X+B
```

```
0059          Z=ABS(Y)
0060          IF(Z.LE.4.75)GO TO 4
0061          X=X-0.5
0062          GO TO 3
0063    4     CONTINUE
0064          X=X+5.
0065          Y=Y+5.
0066          CALL PLOT(X,Y,2)
0067          DATT=DA/SN
0068          DSTT=SQRT((DS/SN)-DATT*DATT)
0069    3     CONTINUE
0070          CALL LLEFT
0071          CALL PLOT(0.,0.,-1)
0072          IDAY=IT(5)
0073          IYEAR=IT(6)
0074          CALL DATE(IDAY,MON,IYEAR)
0075          DAY=IDAY
0076          YEAR=IYEAR
0077          FILE=IWZ
0078          CALL NUMB(1.0,9.0,0.14,DAY,0.0,-1)
0079          CALL SYMB(1.56,9.0,0.14,MON,0.0,3)
0080          CALL NUMB(2.25,9.0,0.14,YEAR,0.0,-1)
0081          CALL SYMB(1.0,8.5,0.14,NCH,0.0,3)
0082          CHN=IS
0083          CALL NUMB(1.56,8.5,0.14,CHN,0.0,-1)
0084          SEC=MS
0085          IF(MS.EQ.0)SEC=0.5
0086          CALL NUMB(2.25,8.5,0.14,SEC,0.0,1)
0087          CALL SYMB(2.85,8.5,0.14,NSEC,0.0,3)
0088          CALL SYMB(3.40,8.5,0.14,NFL,0.0,4)
0089          CALL NUMB(4.10,8.5,0.14,FILE,0.0,-1)
0090          IF(IW1.EQ.0)GO TO 68
0091          FS=5./(XC*30.)
0092          CALL SYMB(1.0,8.0,0.14,NFS,0.0,3)
0093          CALL NUMB(999.0,999.0,0.14,FS,0.0,1)
0094          CALL SYMB(1.0,7.5,0.14,NY,0.0,2)
0095          CALL NUMB(999.0,999.0,0.14,A,0.0,3)
0096          CALL SYMB(999.0,999.0,0.14,NX,0.0,2)
0097          CALL NUMB(999.0,999.0,0.14,B,0.0,3)
0098          CALL SYMB(1.0,7.0,0.14,NA,0.0,4)
0099          CALL NUMB(999.0,999.0,0.14,DATT,0.0,3)
0100          CALL SYMB(3.0,7.0,0.14,NS,0.0,4)
0101          CALL NUMB(999.0,999.0,0.14,DSTT,0.0,3)
0102          CALL SYMB(1.0,6.5,0.14,NP,0.0,4)
0103          CALL NUMB(999.0,999.0,0.14,SN,0.0,-1)
0104    68    CONTINUE
0105          IF(IW2.EQ.0)GO TO 69
0106          CALL LLEFT
0107          CALL PLOT(0.0,0.0,-1)
0108          CALL PLOT(14.5,6.0,3)
0109          CALL PLOT(14.5,1.0,2)
0110          CALL PLOT(3.5,1.0,2)
0111          DX=0.5
0112          XT=3.5
0113          XS=3.43
0114          CH=0.0
0115          DCH=1.0
0116          DO 6 I=1,21
0117          XT=XT+DX
0118          XS=XS+DX
```

```
0119          CH=CH+DCH
0120          CALL PLOT(XT,1.0,3)
0121          CALL PLOT(XT,0.9,2)
0122          CALL NUMB(XS,0.8,0.07,CH,0.0,-1)
0123    6     CONTINUE
0124          YT=0.0
0125          DY=1.0
0126          YS=-0.035
0127          CH=-0.02
0128          DCH=0.02
0129          DO 7 I=1,6
0130          YT=YT+DY
0131          YS=YS+DY
0132          CH=CH+DCH
0133          CALL PLOT(14.5,YT,3)
0134          CALL PLOT(14.6,YT,2)
0135          CALL NUMB(14.65,YS,0.07,CH,0.0,2)
0136    7     CONTINUE
0137          CALL SYMB(7.5,0.25,0.14,NAME,0.0,17)
0138          CALL LLEFT
0139    69    CONTINUE
0140          IW5=2
0141          RETURN
0142          END
0143          END$
```

```
SWLTR9 T=00004 IS ON CR00002 USING 00005 BLKS R=0038

0001   FTN4,L,T
0002         SUBROUTINE WLTR9
0003   C*****************************************************************
0004   C      WLTR9 IS A SUBROUTINE OF WLTRR WHICH MAY BE USED TO PRINT
0005   C      AVERAGES OF ALL CHANNELS ON ANY LU.
0006   C*****************************************************************
0007         COMMON F,S(94),IT(6)
0008         COMMON A3(3,3),B3(3)
0009         COMMON A4(4,4),B4(4)
0010         COMMON A5(5,5),B5(5)
0011         COMMON A7(7,7),B7(7)
0012         COMMON A10(10,10),B10(10)
0013         COMMON P,MN,IS,IMT,MS,MAVG
0014         COMMON SN,SX,SY,SYX,SXX,XC,YC,DA,DS
0015         COMMON WT(21),IARRY
0016         COMMON SUMB(5),BALL(29)
0017         COMMON IW1,IW2,IW3,IW4,IW5,IW9,IWZ
0018         COMMON F9,S9(94)
0019         F9=F9+F
0020         DO 1 I=1,94
0021   1     S9(I)=S9(I)+S(I)
0022         MO=MOD(IT(3),MAVG)
0023         IF(MO.NE.0)GO TO 69
0024         IF(IT(2).NE.0)GO TO 69
0025         IF(IW9.EQ.1)CALL PAGE(1)
0026         WRITE(IW9,99)IT(5),IT(4),IT(3),IT(2),IT(1)
0027   99    FORMAT(1H1,"TIME ",5I4/)
0028         DO 2 I=1,94
0029         S9(I)=S9(I)/F9
0030   2     CONTINUE
0031         WRITE(IW9,98)(I,S9(I+1),I=0,93)
0032   98    FORMAT(6(1H ,@3,"=",F5.1))
0033         WRITE(IW9,97)F9
0034   97    FORMAT(1H0,"# SAMPLES ",F7.0/1H1)
0035         IF(IW9.EQ.1)CALL COPY(1)
0036         F9=0.0
0037         DO 3 I=1,94
0038   3     S9(I)=0.0
0039   69    CONTINUE
0040         RETURN
0041         END
0042         END$
```

```
$WLTR4 T=00004 IS ON CR00002 USING 00013 BLKS R=0118

0001  FTN4,L,T
0002        PROGRAM WLTR4
0003  C*****************************************************************
0004  C     WLTR4 IS CALLED BY WLTRR FOR REAL TIME ANALYSIS.
0005  C*****************************************************************
0006        COMMON F,S(94),IT(6)
0007        COMMON A3(3,3),B3(3)
0008        COMMON A4(4,4),B4(4)
0009        COMMON A5(5,5),B5(5)
0010        COMMON A7(7,7),B7(7)
0011        COMMON A10(10,10),B10(10)
0012        COMMON P,MN,IS,IMT,MS,MAVG
0013        COMMON SN,SX,SY,SYX,SXX,XC,YC,DA,DS
0014        COMMON WT(21),IARRY
0015        COMMON SUMB(5),BALL(29)
0016        COMMON IW1,IW2,IW3,IW4,IW5,IW9,IWZ
0017        COMMON F9,S9(94)
0018        DIMENSION XV(29),YV(29),G(4,5),D(4,4),FP(5),V(4)
0019        DIMENSION WTN(21)
0020        DATA XV/4.,11.,18.,3.,8.,13.,18.,2.5,6.5,10.5,
0021       *14.5,18.5,2.,5.,8.,11.,14.,17.,20.,1.5,3.5,5.5,
0022       *7.5,9.5,11.5,13.5,15.5,17.5,19.5/
0023        CUBIC(V1,V2,V3,V4,X)=V1*X*X*X+V2*X*X+V3*X+V4
0024        CALL PLTLU(10)
0025        CALL SFACT(15.,10.)
0026        CALL LLEFT
0027        CALL PLOT(0.0,0.0,-1)
0028        CALL PLOT(3.5,1.0,3)
0029        N=0
0030        SUM=0.0
0031        DO 8 M=1,5
0032        SUM=SUM+SUMB(M)
0033        GO TO (1,2,3,4,5),M
0034  1     J=3
0035        FJ=7.
0036        TFK=1.
0037        GO TO 6
0038  2     J=4
0039        FJ=5.
0040        TFK=20./21.
0041        GO TO 6
0042  3     J=5
0043        FJ=4.
0044        TFK=20./21.
0045        GO TO 6
0046  4     J=7
0047        FJ=3.
0048        TFK=1.
0049        GO TO 6
0050  5     J=10
0051        FJ=2.
0052        TFK=20./21.
0053  6     CONTINUE
0054        DO 7 I=1,J
0055        N=N+1
0056        ISYMB=M
0057        DEN=TFK/(SUMB(M)*FJ)
0058        YV(N)=BALL(N)*DEN
```

```
0059          XP=XV(N)/2.+3.5
0060          YPL=YV(N)*50.+1.
0061          IF(YPL.LE.0.2)ISYMB=ISYMB+5
0062          IF(YPL.LE.0.2)YPL=0.2
0063          IF(YPL.GE.9.8)ISYMB=ISYMB+5
0064          IF(YPL.GE.9.8)YPL=9.8
0065          CALL SYMB(XP,YPL,0.14,ISYMB,0.0,-1)
0066    7     CONTINUE
0067    8     CONTINUE
0068          CALL PLOT(3.5,1.0,3)
0069          M=4
0070          M1=N
0071          N1=29
0072          N2=4
0073          N3=5
0074          CALL PLSFT(M,M1,N1,N2,N3,XV,YV,G,D,FP,V,IDN)
0075          IF(IDN.NE.1)GO TO 68
0076          V1=V(1)
0077          V2=V(2)
0078          V3=V(3)
0079          V4=V(4)
0080          SUMC=0.0
0081          ISYMB=3
0082          DO 9 L=1,21
0083          X=L
0084          Y=CUBIC(V1,V2,V3,V4,X)
0085          WTN(L)=Y
0086          SUMC=SUMC+Y
0087          X=X/2.+3.5
0088          YPL=Y*50.+1.
0089          IF(YPL.LT.0.2)YPL=0.2
0090          IF(YPL.GT.9.8)YPL=9.8
0091          CALL PLOT(X,YPL,ISYMB)
0092          ISYMB=2
0093    9     CONTINUE
0094          CALL LLEFT
0095          DO 10 L=1,21
0096    10    WTN(L)=WTN(L)/SUMC
0097          SUM=1./(SUM/5.)
0098          YCN=YC*SUM
0099          WRITE(6,99)
0100    99    FORMAT(//" WEIGHTS ARE"/)
0101          DO 11 LS=1,19,3
0102          LN=LS+2
0103    11    WRITE(6,98)LS,(WTN(L),L=LS,LN)
0104    98    FORMAT(1H ,I3,3F10.5)
0105          WRITE(6,97)V1,V2,V3,V4
0106    97    FORMAT(/" Y=",F8.5,"*X3+",F8.5,"*X2+",F8.5,"*X+",F8.5)
0107          WRITE(6,96)YCN
0108    96    FORMAT(/" NEW YCAL =",F12.7)
0109          GO TO 69
0110    68    IF(IDN.EQ.0)WRITE(6,95)
0111          IF(IDN.LE.-1)WRITE(6,94)
0112    95    FORMAT(1HO,"MATRIX IS SINGULAR")
0113    94    FORMAT(1HO,"NUMBER SIZE EXCEEDED")
0114    69    CONTINUE
0115          STOP
0116          END
0117          END$
```

```
$WLTMC T=00004 IS ON CR00002 USING 00020 BLKS R=0146

0001  FTN4,L,T
0002        PROGRAM WLTMC,3
0003  C*************************************************************
0004  C     WLTMC IS USED TO LOAD COMMON WITH THE DESIRED
0005  C     PARAMETERS FOR MAG TAPE ANALYSIS WITH WLTMG.
0006  C*************************************************************
0007        COMMON F,S(22),IT(6)
0008        COMMON A7(4,4),B7(4),XP7(4),NA7,NS7(4),SB7,BA7(4)
0009        COMMON A6(5,5),B6(5),XP6(5),NA6,NS6(5),SB6,BA6(5)
0010        COMMON A5(5,5),B5(5),XP5(5),NA5,NS5(5),SB5,BA5(5)
0011        COMMON A4(6,6),B4(6),XP4(6),NA4,NS4(6),SB4,BA4(6)
0012        COMMON A3(8,8),B3(8),XP3(8),NA3,NS3(8),SB3,BA3(8)
0013        COMMON A2(11,11),B2(11),XP2(11),NA2,NS2(11),SB2,BA2(11)
0014        COMMON P,NB,MN,IS,MS,IARRY
0015        COMMON IW1,IW2,IW3,IW4,IW5,IWZ
0016        COMMON WT(21)
0017        COMMON XC,YC,SN,SX,SY,SXX,SYX,DA,DS
0018        DIMENSION IP(5)
0019        CALL RMPAR(IP)
0020        LU1=IP(1)
0021        LU2=IP(2)
0022        LU3=IP(3)
0023        LP=IP(4)
0024        IF(LU1.EQ.0)LU1=1
0025        IF(LU2.EQ.0)LU2=1
0026        IF(LU3.EQ.0)LU3=1
0027        IF(LP.EQ.0)LP=1
0028  C     ZERO OUT ARRAYS
0029        DO 1 I=1,11
0030        DO 1 J=1,11
0031        A2(I,J)=0.0
0032        B2(I)=0.0
0033        XP2(I)=0.0
0034        NS2(I)=0
0035        BA2(I)=0.0
0036        IF(I.GT.8.OR.J.GT.8)GO TO 1
0037        A3(I,J)=0.0
0038        B3(I)=0.0
0039        XP3(I)=0.0
0040        NS3(I)=0
0041        BA3(I)=0.0
0042        IF(I.GT.6.OR.J.GT.6)GO TO 1
0043        A4(I,J)=0.0
0044        B4(I)=0.0
0045        XP4(I)=0.0
0046        NS4(I)=0
0047        BA4(I)=0.0
0048        IF(I.GT.5.OR.J.GT.5)GO TO 1
0049        A5(I,J)=0.0
0050        B5(I)=0.0
0051        XP5(I)=0.0
0052        NS5(I)=0
0053        BA5(I)=0.0
0054        A6(I,J)=0.0
0055        B6(I)=0.0
0056        XP6(I)=0.0
0057        NS6(I)=0
0058        BA6(I)=0.0
```

```
0059          IF(I.GT.4.OR.J.GT.4)GO TO 1
0060          A7(I,J)=0.0
0061          B7(I)=0.0
0062          XP7(I)=0.0
0063          NS7(I)=0
0064          BA7(I)=0.0
0065    1     CONTINUE
0066          NA7=0
0067          SB7=0.0
0068          NA6=0
0069          SB6=0.0
0070          NA5=0
0071          SB5=0.0
0072          NA4=0
0073          SB4=0.0
0074          NA3=0
0075          SB3=0.0
0076          NA2=0
0077          SB2=0.0
0078    C     ZERO SUMS FOR WLTM1
0079          P=0.0
0080          DA=0.0
0081          DS=0.0
0082          SN=0.0
0083          SX=0.0
0084          SY=0.0
0085          SYX=0.0
0086          SXX=0.0
0087    C     GET CALIBRATION AND WEIGHTS FOR WLTM1.
0088          IF(LP.NE.1)WRITE(LP,199)
0089    199   FORMAT(1H1,2X,"CALIBRATION FACTORS FOR REAL TIME ANALYSIS"/
0090         *1H0,2X,"WEIGHTS FOR ANEMOMETERS ARE"/)
0091          IF(LU1.EQ.1)WRITE(1,99)
0092    99    FORMAT("INPUT WEIGHTS"/)
0093          DO 2 I=1,21
0094          IF(LU1.EQ.1)WRITE(1,98)I
0095          READ(LU1,*)WT(I)
0096          IF(LP.NE.1)WRITE(LP,198)I,WT(I)
0097    2     CONTINUE
0098    98    FORMAT(I2,3X,"_")
0099    198   FORMAT(1H ,I2,F10.5)
0100          IF(LU2.EQ.1)WRITE(1,97)
0101    97    FORMAT("INPUT XCAL, YCAL",3X,"_")
0102          READ(LU2,*)XC,YC
0103          IF(LP.NE.1)WRITE(LP,197)XC,YC
0104    197   FORMAT(1H0,2X,"XCAL,YCAL ARE",F10.7,",",F10.7)
0105          IF(LU2.EQ.1)WRITE(1,96)
0106    96    FORMAT("INPUT # OF SENSOR",3X,"_")
0107          READ(LU2,*)IS
0108          IF(LP.NE.1)WRITE(LP,196)IS
0109    196   FORMAT(1H0,2X,"SENSOR #",I4)
0110          IF(LU2.EQ.1)WRITE(1,95)
0111    95    FORMAT("INPUT TIME INTERVAL IN MINUTES FOR WLTM3",3X,"_")
0112          READ(LU2,*)MN
0113          IF(LP.NE.1)WRITE(LP,195)MN
0114    195   FORMAT(1H0,2X,"LEAST SQUARES READOUT EVERY",I3," MINUTES")
0115    C     DETERMINE IF .5K OR 2K WANTED.
0116          IF(LU2.EQ.1)WRITE(1,93)
0117    93    FORMAT("ENTER 0 FOR .5K OR 2 FOR 2K",3X,"_")
0118          READ(LU2,*)IARRY
```

```
0119          IF(IARRY.EQ.0)WRITE(LP,193)
0120          IF(IARRY.EQ.2)WRITE(LP,200)
0121   193    FORMAT(1H0,2X,"ANALYSIS FOR THE 1/2 K ARRAY")
0122   200    FORMAT(1H0,2X,"ANALYSIS FOR THE   2 K ARRAY")
0123          IF(LU3.EQ.1)WRITE(1,92)
0124   92     FORMAT("INPUT 0 OR 1 FOR SUBS DESIRED"/
0125         *"OR TO DESIGNATE OTHER PARAMETERS")
0126          IF(LP.NE.1)WRITE(LP,192)
0127   192    FORMAT(1H0,2X,"SUBS DESIRED OR OTHER PARAMETERS")
0128   91     FORMAT("IW1",3X,"_")
0129   90     FORMAT("IW2",3X,"_")
0130   89     FORMAT("IW3",3X,"_")
0131   88     FORMAT("IW4",3X,"_")
0132   87     FORMAT("IW5",3X,"_")
0133   191    FORMAT(1H ,2X,"IW1",I5)
0134   190    FORMAT(1H ,2X,"IW2",I5)
0135   189    FORMAT(1H ,2X,"IW3",I5)
0136   188    FORMAT(1H ,2X,"IW4",I5)
0137   187    FORMAT(1H ,2X,"IW5",I5)
0138          IF(LU3.EQ.1)WRITE(1,91)
0139          READ(LU3,*)IW1
0140          IF(LP.NE.1)WRITE(LP,191)IW1
0141          IF(LU3.EQ.1)WRITE(1,90)
0142          READ(LU3,*)IW2
0143          IF(LP.NE.1)WRITE(LP,190)IW2
0144          IF(LU3.EQ.1)WRITE(1,89)
0145          READ(LU3,*)IW3
0146          IF(LP.NE.1)WRITE(LP,189)IW3
0147          IF(LU3.EQ.1)WRITE(1,88)
0148          READ(LU3,*)IW4
0149          IF(LP.NE.1)WRITE(LP,188)IW4
0150          IF(LU3.EQ.1)WRITE(1,87)
0151          READ(LU3,*)IW5
0152          IF(LP.NE.1)WRITE(LP,187)IW5
0153          WRITE(1,85)
0154   85     FORMAT("ENTER FILE # ON TAPE",3X,"_")
0155          READ(1,*)IWZ
0156          IF(LP.NE.1)WRITE(LP,185)IWZ
0157   185    FORMAT(1H0,2X,"TAPE FILE #",I2)
0158          WRITE(1,84)
0159   84     FORMAT("INPUT TIME INTERVAL IN SECONDS",3X,"_")
0160          READ(1,*)MS
0161          IF(LP.NE.1)WRITE(LP,184)MS
0162   184    FORMAT(1H0,2X,"AVERAGING TIME IS",I3," SECONDS")
0163          WRITE(1,83)
0164   83     FORMAT(/"THAT'S ALL, THANKS")
0165          STOP
0166          END
0167          END$
```

```
$WLTMG T=00004 IS ON CR00002 USING 00014 BLKS R=0114

0001  FTN4,L,T
0002        PROGRAM WLTMG,3
0003  C*****************************************************
0004        COMMON F,S(22),IT(6)
0005        COMMON A7(4,4),B7(4),XP7(4),NA7,NS7(4),SB7,BA7(4)
0006        COMMON A6(5,5),B6(5),XP6(5),NA6,NS6(5),SB6,BA6(5)
0007        COMMON A5(5,5),B5(5),XP5(5),NA5,NS5(5),SB5,BA5(5)
0008        COMMON A4(6,6),B4(6),XP4(6),NA4,NS4(6),SB4,BA4(6)
0009        COMMON A3(8,8),B3(8),XP3(8),NA3,NS3(8),SB3,BA3(8)
0010        COMMON A2(11,11),B2(11),XP2(11),NA2,NS2(11),SB2,BA2(11)
0011        COMMON P,NB,MN,IS,MS,IARRY
0012        COMMON IW1,IW2,IW3,IW4,IW5,IWZ
0013        COMMON WT(21)
0014        COMMON XC,YC,SN,SX,SY,SXX,SYX,DA,DS
0015        DIMENSION ITM(5),IDT(94),IDATA(100)
0016        DIMENSION ST(37)
0017        DIMENSION NW4(3),MON(2)
0018        EQUIVALENCE (ITM(1),IDATA(1)),(IY,IDATA(6)),
0019       *(IDT(1),IDATA(7))
0020        DATA NW4/2HWL,2HTM,2H4 /
0021  1     CONTINUE
0022        CALL EXEC(3,611B)
0023        CALL EXEC(13,9,ISTAT)
0024        ISTT=IAND(ISTAT,1B)
0025        IF(ISTT.NE.0)GO TO 1
0026        ISTT=IAND(ISTAT,200B)
0027        IF(ISTT.EQ.0)GO TO 2
0028        CALL EXEC(3,311B)
0029  2     CONTINUE
0030        CALL EXEC(1,111B,IDATA,100)
0031        CALL EXEC(3,211B)
0032        SEC=MS
0033        IF(MS.EQ.0)SEC=0.5
0034        IDAY=ITM(5)
0035        LIT=ITM(3)
0036        CALL DATE(IDAY,MON,IY)
0037        WRITE(6,99)IS,SEC,IW3,ITM(4),ITM(3),ITM(2),IDAY,MON,IY
0038  99    FORMAT(1H1,"ANALYSIS OF CH #",I3,", WITH",F5.1," SEC AVG."/
0039       *1H ,"WITH SLIDE FACTOR OF",I3/
0040       *1H ,"FOR DATA BEGINNING",I3,":",I2,":",I2," ON",I3,1X,2A2,I4
0041        CALL EXEC(11,ITM,IY)
0042        IDAY=ITM(5)
0043        CALL DATE(IDAY,MON,IY)
0044        WRITE(6,98)ITM(4),ITM(3),ITM(2),IDAY,MON,IY
0045  98    FORMAT(1H ,"ANALYSIS STARTED",I3,":",I2,":",I2," ON",I3,1X,2A2
0046        IF(IW1.EQ.0)GO TO 3
0047        CALL WLTM5
0048  3     CONTINUE
0049        DO 67 IRPT=1,32767
0050        F=0.0
0051        DO 4 I=1,37
0052  4     ST(I)=0.0
0053        DO 6 I=1,200
0054        CALL EXEC(1,111B,IDATA,100)
0055        CALL EXEC(13,9,ISTAT)
0056        ISTAT=IAND(ISTAT,200B)
0057        IF(ISTAT.NE.0)GO TO 68
0058        F=F+1.
```

```
0059          DO 5 J=1,36
0060    5     ST(J)=ST(J)+FLOAT(IDT(J))
0061          ST(37)=ST(37)+FLOAT(IDT(IS))
0062          IF(MS.EQ.0)GO TO 7
0063          ISTAT=MOD(ITM(2),MS)
0064          IF(ISTAT.NE.0)GO TO 6
0065          IF(ITM(1).GE.50)GO TO 6
0066          GO TO 7
0067    6     CONTINUE
0068    7     CONTINUE
0069          DO 8 J=1,6
0070    8     IT(J)=IDATA(J)
0071          IF(IT(3).EQ.LIT)GO TO 9
0072          ISWTM=IT(3)+IT(4)*1000B
0073          CALL PSSW(ISWTM)
0074          LIT=IT(3)
0075    9     CONTINUE
0076    C     CHECK FOR .5K OR 2K RANGE.
0077          IF(IARRY.LE.1)GO TO 12
0078          K=0
0079          DO 10 I=1,21,4
0080          K=K+1
0081    10    S(K)=ST(I)*XC/F
0082          DO 11 I=22,36
0083          K=K+1
0084    11    S(K)=ST(I)*XC/F
0085          GO TO 14
0086    12    CONTINUE
0087          DO 13 I=1,21
0088    13    S(I)=ST(I)*XC/F
0089    14    CONTINUE
0090          S(22)=ST(37)*YC/F
0091    C     SUM ALL POINTS.
0092          P=P+F
0093          IF(IW1.EQ.0)GO TO 15
0094          CALL WLTM1
0095    15    CONTINUE
0096          CALL WLTM2
0097          IF(MN.EQ.0)GO TO 67
0098          MO=MOD(IT(3),MN)
0099          IF(MO.NE.0)GO TO 67
0100          IF(IT(2).NE.0)GO TO 67
0101          IF(IT(1).GE.50)GO TO 67
0102          CALL WLTM3
0103    67    CONTINUE
0104    68    CONTINUE
0105          IF(IWZ.LE.1)GO TO 16
0106          CALL EXEC(3,211B)
0107          CALL EXEC(3,1411B)
0108          GO TO 17
0109    16    CALL EXEC(3,411B)
0110    17    CONTINUE
0111          IF(IW4.NE.1)GO TO 18
0112          CALL WLTM5
0113    18    CONTINUE
0114          CALL WLTM3
0115          CALL EXEC(10,NW4)
0116    69    CONTINUE
0117          STOP
0118          END
0119          END$
```

```
SWLTM1 T=00004 IS ON CR00002 USING 00006 BLKS R=0043

0001   FTN4,L,T
0002         SUBROUTINE WLTM1
0003   C*****************************************************************
0004   C      WLTM1 IS USED TO MAKE THE CORRELATION PLOT OF A SENSOR
0005   C      VERSUS A WEIGHTED AVERAGE OF 21 ANEMOMETERS FROM DATA
0006   C      FROM MAG TAPE.
0007   C*****************************************************
0008         COMMON F,S(22),IT(6)
0009         COMMON A7(4,4),B7(4),XP7(4),NA7,NS7(4),SB7,BA7(4)
0010         COMMON A6(5,5),B6(5),XP6(5),NA6,NS6(5),SB6,BA6(5)
0011         COMMON A5(5,5),B5(5),XP5(5),NA5,NS5(5),SB5,BA5(5)
0012         COMMON A4(6,6),B4(6),XP4(6),NA4,NS4(6),SB4,BA4(6)
0013         COMMON A3(8,8),B3(8),XP3(8),NA3,NS3(8),SB3,BA3(8)
0014         COMMON A2(11,11),B2(11),XP2(11),NA2,NS2(11),SB2,BA2(11)
0015         COMMON P,NB,MN,IS,MS,IARRY
0016         COMMON IW1,IW2,IW3,IW4,IW5,IW2
0017         COMMON WT(21)
0018         COMMON XC,YC,SN,SX,SY,SXX,SYX,DA,DS
0019         CALL PLTLU(10)
0020         CALL SFACT(15.,10.)
0021         Y=S(22)
0022         X=0.0
0023         DO 1 I=1,21
0024   1     X=X+S(I)*WT(I)
0025         SN=SN+1.0
0026         D=(Y-X)/10
0027         DA=DA+D
0028         DS=DS+D*D
0029         SX=SX+X
0030         SY=SY+Y
0031         SYX=SYX+Y*X
0032         SXX=SXX+X*X
0033         Z=ABS(X)
0034         IF(Z.GE.4.75)X=4.75*X/Z
0035         IX=(X*1000.+5000.)*2./3.
0036         Z=ABS(Y)
0037         IF(Z.GE.4.75)Y=4.75*Y/Z
0038         IY=Y*1000.+5000.
0039         CALL PLT(0.0,1,IX,IY)
0040   69    CONTINUE
0041         RETURN
0042         END
0043         END$
```

```
SWLTM2 T=00004 IS ON CR00002 USING 00021 BLKS R=0205

0001   FTN4,L,T
0002         SUBROUTINE WLTM2
0003   C*****************************************************************
0004   C      WLTM2 IS USED TO LOAD THE ARRAYS FOR THE LEAST SQUARES
0005   C      CORRELATION FIT TO WEIGHTING FACTORS FOR DATA FROM MAG
0006   C      TAPE.
0007   C*****************************************************
0008         COMMON F,S(22),IT(6)
0009         COMMON A7(4,4),B7(4),XP7(4),NA7,NS7(4),SB7,BA7(4)
0010         COMMON A6(5,5),B6(5),XP6(5),NA6,NS6(5),SB6,BA6(5)
0011         COMMON A5(5,5),B5(5),XP5(5),NA5,NS5(5),SB5,BA5(5)
0012         COMMON A4(6,6),B4(6),XP4(6),NA4,NS4(6),SB4,BA4(6)
0013         COMMON A3(8,8),B3(8),XP3(8),NA3,NS3(8),SB3,BA3(8)
0014         COMMON A2(11,11),B2(11),XP2(11),NA2,NS2(11),SB2,BA2(11)
0015         COMMON P,NB,MN,IS,MS,IARRY
0016         COMMON IW1,IW2,IW3,IW4,IW5,IWZ
0017         COMMON WT(21)
0018         COMMON XC,YC,SN,SX,SY,SXX,SYX,DA,DS
0019         DIMENSION D(11),NS(11),XP(11)
0020         IF(IW2.GT.1.)GO TO 68
0021         NB=0
0022         NA7=0
0023         NA6=0
0024         NA5=0
0025         NA4=0
0026         NA3=0
0027         NA2=0
0028         DO 67 INOW=1,IW5
0029         GO TO (1,2,3,4,5,6),INOW
0030   1     JCNT=4
0031         KCNT=7
0032         GO TO 7
0033   2     JCNT=5
0034         KCNT=6
0035         GO TO 7
0036   3     JCNT=5
0037         KCNT=5
0038         GO TO 7
0039   4     JCNT=6
0040         KCNT=4
0041         GO TO 7
0042   5     JCNT=8
0043         KCNT=3
0044         GO TO 7
0045   6     JCNT=11
0046         KCNT=2
0047   7     CONTINUE
0048         NA=1
0049         DO 9 J=1,JCNT
0050         NS(NA)=0
0051         XP(NA)=0.0
0052         DO 8 K=1,KCNT
0053         L=(J-1)*KCNT+K+IW3
0054         IF(L.LT.1.OR.L.GT.21)GO TO 8
0055         IFLAG=L
0056         NS(NA)=NS(NA)+1
0057         XP(NA)=XP(NA)+FLOAT(L)
0058   8     CONTINUE
```

```
0059          IF(NS(NA).EQ.0)GO TO 9
0060          ADEC=NS(NA)
0061          XP(NA)=XP(NA)/ADEC
0062          NA=NA+1
0063    9     CONTINUE
0064          NA=NA-1
0065          GO TO (10,12,14,16,18,20),INOW
0066    10    NA7=NA
0067          IF(IFLAG.LT.21)NA7=0
0068          NB=NB+NA7
0069          DO 11 J=1,JCNT
0070          XP7(J)=XP(J)
0071    11    NS7(J)=NS(J)
0072          GO TO 67
0073    12    NA6=NA
0074          IF(IW3.LE.-6)IFLAG=0
0075          IF(IFLAG.LT.21)NA6=0
0076          NB=NB+NA6
0077          DO 13 J=1,JCNT
0078          XP6(J)=XP(J)
0079    13    NS6(J)=NS(J)
0080          GO TO 67
0081    14    NA5=NA
0082          IF(IFLAG.LT.21)NA5=0
0083          NB=NB+NA5
0084          DO 15 J=1,JCNT
0085          XP5(J)=XP(J)
0086    15    NS5(J)=NS(J)
0087          GO TO 67
0088    16    NA4=NA
0089          IF(IFLAG.LT.21)NA4=0
0090          NB=NB+NA4
0091          DO 17 J=1,JCNT
0092          XP4(J)=XP(J)
0093    17    NS4(J)=NS(J)
0094          GO TO 67
0095    18    NA3=NA
0096          IF(IW3.LE.-3)IFLAG=0
0097          IF(IFLAG.LT.21)NA3=0
0098          NB=NB+NA3
0099          DO 19 J=1,JCNT
0100          XP3(J)=XP(J)
0101    19    NS3(J)=NS(J)
0102          GO TO 67
0103    20    NA2=NA
0104          IF(IFLAG.LT.21)NA2=0
0105          NB=NB+NA2
0106          DO 21 J=1,JCNT
0107          XP2(J)=XP(J)
0108    21    NS2(J)=NS(J)
0109    67    CONTINUE
0110          IW2=2
0111    68    CONTINUE
0112          IF(NA7.LE.0)GO TO 25
0113          L=0
0114          DO 24 J=1,NA7
0115          KJ=NS7(J)
0116          D(J)=0.0
0117          DO 22 K=1,KJ
0118          L=L+1
```

```
0119          D(J)=D(J)+S(L)
0120    22    CONTINUE
0121          ADEC=KJ
0122          D(J)=D(J)/ADEC
0123          B7(J)=B7(J)+S(22)*D(J)
0124          DO 23 I=1,J
0125    23    A7(I,J)=A7(I,J)+D(I)*D(J)
0126    24    CONTINUE
0127    25    CONTINUE
0128          IF(NA6.LE.0)GO TO 29
0129          L=0
0130          DO 28 J=1,NA6
0131          D(J)=0.0
0132          KJ=NS6(J)
0133          DO 26 K=1,KJ
0134          L=L+1
0135          D(J)=D(J)+S(L)
0136    26    CONTINUE
0137          ADEC=KJ
0138          D(J)=D(J)/ADEC
0139          B6(J)=B6(J)+S(22)*D(J)
0140          DO 27 I=1,J
0141    27    A6(I,J)=A6(I,J)+D(I)*D(J)
0142    28    CONTINUE
0143    29    CONTINUE
0144          IF(NA5.LE.0)GO TO 33
0145          L=0
0146          DO 32 J=1,NA5
0147          D(J)=0.0
0148          KJ=NS5(J)
0149          DO 30 K=1,KJ
0150          L=L+1
0151          D(J)=D(J)+S(L)
0152    30    CONTINUE
0153          ADEC=KJ
0154          D(J)=D(J)/ADEC
0155          B5(J)=B5(J)+S(22)*D(J)
0156          DO 31 I=1,J
0157    31    A5(I,J)=A5(I,J)+D(I)*D(J)
0158    32    CONTINUE
0159    33    CONTINUE
0160          IF(NA4.LE.0)GO TO 37
0161          L=0
0162          DO 36 J=1,NA4
0163          D(J)=0.0
0164          KJ=NS4(J)
0165          DO 34 K=1,KJ
0166          L=L+1
0167          D(J)=D(J)+S(L)
0168    34    CONTINUE
0169          ADEC=KJ
0170          D(J)=D(J)/ADEC
0171          B4(J)=B4(J)+S(22)*D(J)
0172          DO 35 I=1,J
0173    35    A4(I,J)=A4(I,J)+D(I)*D(J)
0174    36    CONTINUE
0175    37    CONTINUE
0176          IF(NA3.LE.0)GO TO 41
0177          L=0
0178          DO 40 J=1,NA3
```

```
0179          D(J)=0.0
0180          KJ=NS3(J)
0181          DO 38 K=1,KJ
0182          L=L+1
0183          D(J)=D(J)+S(L)
0184    38    CONTINUE
0185          ADEC=KJ
0186          D(J)=D(J)/ADEC
0187          B3(J)=B3(J)+S(22)*D(J)
0188          DO 39 I=1,J
0189    39    A3(I,J)=A3(I,J)+D(I)*D(J)
0190    40    CONTINUE
0191    41    CONTINUE
0192          IF(NA2 LE 0)GO TO 69
0193          L=0
0194          DO 44 J=1,NA2
0195          D(J)=0.0
0196          KJ=NS2(J)
0197          DO 42 K=1,KJ
0198          L=L+1
0199          D(J)=D(J)+S(L)
0200    42    CONTINUE
0201          ADEC=KJ
0202          D(J)=D(J)/ADEC
0203          B2(J)=B2(J)+S(22)*D(J)
0204          DO 43 I=1,J
0205    43    A2(I,J)=A2(I,J)+D(I)*D(J)
0206    44    CONTINUE
0207    69    CONTINUE
0208          RETURN
0209          END
0210          END$
```

```
SWLTM3 T=00004 IS ON CR00002 USING 00011 BLKS R=0091

0001   FTN4,L,T
0002         SUBROUTINE WLTM3
0003   C*************************************************************
0004   C      WLTM3 IS USED TO COMPUTE THE FIT FOR WEIGHTING FACTORS
0005   C      FOR DATA FROM MAG TAPE.
0006   C*************************************************
0007         COMMON F,S(22),IT(6)
0008         COMMON A7(4,4),B7(4),XP7(4),NA7,NS7(4),SB7,BA7(4)
0009         COMMON A6(5,5),B6(5),XP6(5),NA6,NS6(5),SB6,BA6(5)
0010         COMMON A5(5,5),B5(5),XP5(5),NA5,NS5(5),SB5,BA5(5)
0011         COMMON A4(6,6),B4(6),XP4(6),NA4,NS4(6),SB4,BA4(6)
0012         COMMON A3(8,8),B3(8),XP3(8),NA3,NS3(8),SB3,BA3(8)
0013         COMMON A2(11,11),B2(11),XP2(11),NA2,NS2(11),SB2,BA2(11)
0014         COMMON P,NB,MN,IS,MS,IARRY
0015         COMMON IW1,IW2,IW3,IW4,IW5,IWZ
0016         COMMON WT(21)
0017         COMMON XC,YC,SN,SX,SY,SXX,SYX,DA,DS
0018         DIMENSION A(11,11)
0019         WRITE(6,99)IT(4),IT(3),P
0020   99    FORMAT(1H0,"AT",I3,":",I2," WITH",F10.0," POINTS")
0021         DO 69 L=1,IW5
0022         GO TO (1,3,5,7,9,11),L
0023   1     CONTINUE
0024         IF(NA7.LE.0)GO TO 69
0025         DO 2 J=1,NA7
0026         BA7(J)=B7(J)
0027         DO 2 I=1,J
0028         A(I,J)=A7(I,J)
0029   2     A(J,I)=A7(I,J)
0030         NG=7
0031         MTS=4
0032         CALL W3SUB(A,B7,XP7,NA7,NS7,SB7,BA7,NG,MTS)
0033         IF(NG.EQ.7)GO TO 69
0034         NB=NB-NA7
0035         NA7=-1
0036         GO TO 69
0037   3     CONTINUE
0038         IF(NA6.LE.0)GO TO 69
0039         DO 4 J=1,NA6
0040         BA6(J)=B6(J)
0041         DO 4 I=1,J
0042         A(I,J)=A6(I,J)
0043   4     A(J,I)=A6(I,J)
0044         NG=6
0045         MTS=5
0046         CALL W3SUB(A,B6,XP6,NA6,NS6,SB6,BA6,NG,MTS)
0047         IF(NG.EQ.6)GO TO 69
0048         NB=NB-NA6
0049         NA6=-1
0050         GO TO 69
0051   5     CONTINUE
0052         IF(NA5.LE.0)GO TO 69
0053         DO 6 J=1,NA5
0054         BA5(J)=B5(J)
0055         DO 6 I=1,J
0056         A(I,J)=A5(I,J)
0057   6     A(J,I)=A5(I,J)
0058         NG=5
```

```
0059          MTS=5
0060          CALL W3SUB(A,B5,XP5,NA5,NS5,SB5,BA5,NG,MTS)
0061          IF(NG.EQ.5)GO TO 69
0062          NB=NB-NA5
0063          NA5=-1
0064          GO TO 69
0065    7     CONTINUE
0066          IF(NA4.LE.0)GO TO 69
0067          DO 8 J=1,NA4
0068          BA4(J)=B4(J)
0069          DO 8 I=I,J
0070          A(I,J)=A4(I,J)
0071    8     A(J,I)=A4(I,J)
0072          NG=4
0073          MTS=6
0074          CALL W3SUB(A,B4,XP4,NA4,NS4,SB4,BA4,NG,MTS)
0075          IF(NG.EQ.4)GO TO 69
0076          NB=NB-NA4
0077          NA4=-1
0078          GO TO 69
0079    9     CONTINUE
0080          IF(NA3.LE.0)GO TO 69
0081          DO 10 J=1,NA3
0082          BA3(J)=B3(J)
0083          DO 10 I=1,J
0084          A(I,J)=A3(I,J)
0085    10    A(J,I)=A3(I,J)
0086          NG=3
0087          MTS=8
0088          CALL W3SUB(A,B3,XP3,NA3,NS3,SB3,BA3,NG,MTS)
0089          IF(NG.EQ.3)GO TO 69
0090          NB=NB-NA3
0091          NA3=-1
0092          GO TO 69
0093    11    CONTINUE
0094          IF(NA2.LE.0)GO TO 69
0095          DO 12 J=1,NA2
0096          BA2(J)=B2(J)
0097          DO 12 I=1,J
0098          A(I,J)=A2(I,J)
0099    12    A(J,I)=A2(I,J)
0100          NG=2
0101          MTS=11
0102          CALL W3SUB(A,B2,XP2,NA2,NS2,SB2,BA2,NG,MTS)
0103          IF(NG.EQ.2)GO TO 69
0104          NB=NB-NA2
0105          NA2=-1
0106    69    CONTINUE
0107          RETURN
0108          END
0109    C*************************************************************
0110          SUBROUTINE W3SUB(A,B,XP,NA,NS,SB,BA,NG,MTS)
0111          DIMENSION A(11,11),B(MTS),XP(MTS),NS(MTS),EA(MTS)
0112          M=NA
0113          SB=0.0
0114          A11=A(1,1)
0115          IF(A11.EQ.0)GO TO 68
0116          DO 1 I=2,M
0117          A(1,I)=A(I,1)/A11
0118          BA(1)=BA(1)/A11
```

```
0119          DO 5 J=2,M
0120          J1=J-1
0121          DO 3 I=J,M
0122          AS=0.0
0123          DO 2 K=1,J1
0124    2     AS=AS+A(I,K)*A(K,J)
0125          A(I,J)=A(I,J)-AS
0126          IF(I.GT.J)A(J,I)=A(I,J)/A(J,J)
0127    3     CONTINUE
0128          BS=0.0
0129          DO 4 K=1,J1
0130    4     BS=BS+A(J,K)*BA(K)
0131          AJJ=A(J,J)
0132          IF(AJJ.EQ.0)GO TO 68
0133    5     BA(J)=(BA(J)-BS)/AJJ
0134          M1=M-1
0135          DO 7 I=1,M1
0136          BS=0.0
0137          MI=M-I
0138          MI1=MI+1
0139          DO 6 J=MI1,M
0140    6     BS=BS+A(MI,J)*BA(J)
0141          BA(MI)=BA(MI)-BS
0142    7     CONTINUE
0143          WRITE(6,99)NG
0144    99    FORMAT(1H0,"FOR GROUPS OF",I3)
0145          WRITE(6,98)(NS(J),J=1,M)
0146    98    FORMAT(1H ,"#",11I6)
0147          WRITE(6,97)(XP(J),J=1,M)
0148    97    FORMAT(1H ,"X",11F6.1)
0149          WRITE(6,96)(BA(J),J=1,M)
0150    96    FORMAT(1H ,"Y",11F6.3)
0151          DO 8 I=1,M
0152          SB=SB+BA(I)
0153    8     CONTINUE
0154          WRITE(6,95)SB
0155    95    FORMAT(1H ,"SUM OF WEIGHTS =",F8.5)
0156          GO TO 69
0157    68    CONTINUE
0158          WRITE(6,94)NG
0159    94    FORMAT(1H0,"FOR GROUPS OF",I3," MATRIX IS SINGULAR")
0160          NG=-1
0161    69    CONTINUE
0162          RETURN
0163          END
0164          END$
```

```
SWLTM5 T=00004 IS ON CR00002 USING 00018 BLKS R=0142

0001   FTN4,L,T
0002         SUBROUTINE WLTM5
0003   C*****************************************************************
0004   C      WLTM5 IS A PROGRAM WHICH WILL REPORT THE NECESSARY
0005   C      INFORMATION ON PLOTS AND DRAW THE GRID IF REQUIRED.
0006   C*****************************************************
0007         COMMON F,S(22),IT(6)
0008         COMMON A7(4,4),B7(4),XP7(4),NA7,NS7(4),SB7,BA7(4)
0009         COMMON A6(5,5),B6(5),XP6(5),NA6,NS6(5),SB6,BA6(5)
0010         COMMON A5(5,5),B5(5),XP5(5),NA5,NS5(5),SB5,BA5(5)
0011         COMMON A4(6,6),B4(6),XP4(6),NA4,NS4(6),SB4,BA4(6)
0012         COMMON A3(8,8),B3(8),XP3(8),NA3,NS3(8),SB3,BA3(8)
0013         COMMON A2(11,11),B2(11),XP2(11),NA2,NS2(11),SB2,BA2(11)
0014         COMMON P,NB,MN,IS,MS,IARRY
0015         COMMON IW1,IW2,IW3,IW4,IW5,IWZ
0016         COMMON WT(21)
0017         COMMON XC,YC,SN,SX,SY,SXX,SYX,DA,DS
0018         DIMENSION NA(2),NS(2),NP(2),NFS(2),NFL(2)
0019         DIMENSION MON(2),NCH(2),NSEC(2)
0020         DATA NA/2HAV,2HG=/,NS/2HSD,2HV=/
0021         DATA NP/2H#P,2HTS/
0022         DATA NFL/2HFI,2HLE/,NFS/2HFS,2H= /
0023         DATA NSEC/2HSE,2HC /
0024         DATA NCH/2HCH,2H# /
0025         NY=54475B
0026         NX=54053B
0027         CALL PLTLU(10)
0028         CALL SFACT(15.,10.)
0029         CALL LLEFT
0030         CALL PLOT(0.0,0.0,-1)
0031         IF(IW1.EQ.0)GO TO 5
0032         CALL PLOT(0.5,5.0,3)
0033         CALL PLOT(9.5,5.0,2)
0034         CALL PLOT(5.0,0.5,3)
0035         CALL PLOT(5.0,9.5,2)
0036         CALL DASH(0.5,0.5,0.5,0.5,-1)
0037         CALL DASH(0.5,0.5,9.5,9.5,1)
0038         IF(IW1.LE.1)GO TO 69
0039         D=SX*SX-SN*SXX
0040         A=(SX*SY-SN*SYX)/D
0041         B=(SX*SYX-SY*SXX)/D
0042         X=-4.0
0043   1     CONTINUE
0044         Y=A*X+B
0045         Z=ABS(Y)
0046         IF(Z.LE.4.75)GO TO 2
0047         X=X+.5
0048         GO TO 1
0049   2     CONTINUE
0050         X=X+5.
0051         Y=Y+5.
0052         CALL PLOT(X,Y,3)
0053         X=4.0
0054   3     CONTINUE
0055         Y=A*X+B
0056         Z=ABS(Y)
0057         IF(Z.LE.4.75)GO TO 4
0058         X=X-0.5
```

```
0059          GO TO 3
0060    4     CONTINUE
0061          X=X+5.
0062          Y=Y+5.
0063          CALL PLOT(X,Y,2)
0064          DATT=DA/SN
0065          DSTT=SQRT((DS/SN)-DATT*DATT)
0066    5     CONTINUE
0067          CALL LLEFT
0068          CALL PLOT(0.,0.,-1)
0069          IDAY=IT(5)
0070          IYEAR=IT(6)
0071          CALL DATE(IDAY,MON,IYEAR)
0072          DAY=IDAY
0073          YEAR=IYEAR
0074          FILE=IWZ
0075          CHN=IS
0076          SEC=MS
0077          IF(MS.EQ.0)SEC=0.5
0078          FS=5./(XC*30.)
0079          CALL NUMB(1.0,9.0,0.14,DAY,0.0,-1)
0080          CALL SYMB(1.56,9.0,0.14,MON,0.0,3)
0081          CALL NUMB(2.25,9.0,0.14,YEAR,0.0,-1)
0082          CALL SYMB(1.0,8.5,0.14,NCH,0.0,3)
0083          CALL NUMB(1.56,8.5,0.14,CHN,0.0,-1)
0084          CALL NUMB(2.25,8.5,0.14,SEC,0.0,1)
0085          CALL SYMB(2.85,8.5,0.14,NSEC,0.0,3)
0086          CALL SYMB(3.40,8.5,0.14,NFL,0.0,4)
0087          CALL NUMB(4.10,8.5,0.14,FILE,0.0,-1)
0088          IF(IW1.EQ.0)GO TO 69
0089          CALL SYMB(1.0,8.0,0.14,NFS,0.0,3)
0090          CALL NUMB(999.0,999.0,0.14,FS,0.0,1)
0091          CALL SYMB(1.0,7.5,0.14,NY,0.0,2)
0092          CALL NUMB(999.0,999.0,0.14,A,0.0,3)
0093          CALL SYMB(999.0,999.0,0.14,NX,0.0,2)
0094          CALL NUMB(999.0,999.0,0.14,B,0.0,3)
0095          CALL SYMB(1.0,7.0,0.14,NA,0.0,4)
0096          CALL NUMB(999.0,999.0,0.14,DATT,0.0,3)
0097          CALL SYMB(3.0,7.0,0.14,NS,0.0,4)
0098          CALL NUMB(999.0,999.0,0.14,DSTT,0.0,3)
0099          CALL SYMB(1.0,6.5,0.14,NP,0.0,4)
0100          CALL NUMB(1.60,6.5,0.14,SN,0.0,-1)
0101          CALL LLEFT
0102    69    CONTINUE
0103          IF(IW1.EQ.1)IW1=2
0104          RETURN
0105          END
0106          END$
```

```
$WLTM4 T=00004 IS ON CR00002 USING 00012 BLKS R=0097

0001   FTN4,L,T
0002         PROGRAM WLTM4,3
0003   C*************************************************************
0004   C      WLTM4 IS A PROGRAM WHICH NORMALIZES THE RESULTS OF WLTM3,
0005   C      PLOTS, REPORTS, AND PUNCHES A TAPE OF THESE RESULTS.
0006   C      IT CAN ALSO RESCHEDULE WLTMG FOR A REPEAT WITH A DIFFERENT
0007   C      SLIDE FACTOR
0008   C*************************************************
0009         COMMON F,S(22),IT(6)
0010         COMMON A7(4,4),B7(4),XP7(4),NA7,NS7(4),SB7,BA7(4)
0011         COMMON A6(5,5),B6(5),XP6(5),NA6,NS6(5),SB6,BA6(5)
0012         COMMON A5(5,5),B5(5),XP5(5),NA5,NS5(5),SB5,BA5(5)
0013         COMMON A4(6,6),B4(6),XP4(6),NA4,NS4(6),SB4,BA4(6)
0014         COMMON A3(8,8),B3(8),XP3(8),NA3,NS3(8),SB3,BA3(8)
0015         COMMON A2(11,11),B2(11),XP2(11),NA2,NS2(11),SB2,BA2(11)
0016         COMMON P,NB,MN,IS,MS,IARRY
0017         COMMON IW1,IW2,IW3,IW4,IW5,IWZ
0018         COMMON WT(21)
0019         COMMON XC,YC,SN,SX,SY,SXX,SYX,DA,DS
0020         DIMENSION NMG(3)
0021         DATA NMG/2HWL,2HTM,2HG /
0022         CALL EXEC(3,1004B)
0023         WRITE(4,99)NB
0024   99    FORMAT(I3)
0025         DO 7 M=1,IW5
0026         GO TO (1,2,3,4,5,6),M
0027   1     IF(NA7.LE.0)GO TO 7
0028         NG=7
0029         MTS=4
0030         CALL W4SUB(XP7,NA7,NS7,SB7,BA7,NG,MTS)
0031         GO TO 7
0032   2     IF(NA6.LE.0)GO TO 7
0033         NG=6
0034         MTS=5
0035         CALL W4SUB(XP6,NA6,NS6,SB6,BA6,NG,MTS)
0036         GO TO 7
0037   3     IF(NA5.LE.0)GO TO 7
0038         NG=5
0039         MTS=5
0040         CALL W4SUB(XP5,NA5,NS5,SB5,BA5,NG,MTS)
0041         GO TO 7
0042   4     IF(NA4.LE.0)GO TO 7
0043         NG=4
0044         MTS=6
0045         CALL W4SUB(XP4,NA4,NS4,SB4,BA4,NG,MTS)
0046         GO TO 7
0047   5     IF(NA3.LE.0)GO TO 7
0048         NG=3
0049         MTS=8
0050         CALL W4SUB(XP3,NA3,NS3,SB3,BA3,NG,MTS)
0051         GO TO 7
0052   6     IF(NA2.LE.0)GO TO 7
0053         NG=2
0054         MTS=11
0055         CALL W4SUB(XP2,NA2,NS2,SB2,BA2,NG,MTS)
0056   7     CONTINUE
0057         CALL EXEC(11,IT)
0058         WRITE(6,98)IT(4),IT(3),IT(2)
```

```
0059  98    FORMAT(1H0,"ANALYSIS COMPLETED",I3,":",I2,":",I2)
0060        CALL EXEC(3,1004B)
0061        IF(IW4.EQ.1)GO TO 69
0062        IF(IW3.GE.0)GO TO 69
0063        IW3=IW3+1
0064        IF(IW3.EQ.0)IW4=1
0065        IW1=0
0066        IW2=1
0067  C     ZERO OUT ARRAYS FOR WLTM2 AND 3
0068        DO 8 I=1,11
0069        DO 8 J=1,11
0070        A2(I,J)=0.0
0071        B2(I)=0.0
0072        NS2(I)=0
0073        IF(I.GT.8.OR.J.GT.8)GO TO 8
0074        A3(I,J)=0.0
0075        B3(I)=0.0
0076        NS3(I)=0
0077        IF(I.GT.6.OR.J.GT.6)GO TO 8
0078        A4(I,J)=0.0
0079        B4(I)=0.0
0080        NS4(I)=0
0081        IF(I.GT.5.OR.J.GT.5)GO TO 8
0082        A5(I,J)=0.0
0083        B5(I)=0.0
0084        NS5(I)=0
0085        A6(I,J)=0.0
0086        B6(I)=0.0
0087        NS6(I)=0
0088        IF(I.GT.4.OR.J.GT.4)GO TO 8
0089        A7(I,J)=0.0
0090        B7(I)=0.0
0091        NS7(I)=0
0092  8     CONTINUE
0093        P=0.0
0094        CALL EXEC(10,NMG)
0095  69    CONTINUE
0096        STOP
0097        END
0098  C*************************************************************
0099        SUBROUTINE W4SUB(XP,NA,NS,SB,BA,NG,MTS)
0100        DIMENSION XP(MTS),NS(MTS),BA(MTS)
0101        CALL PLTLU(10)
0102        CALL SFACT(15.,10.)
0103        CALL LLEFT
0104        CALL PLOT(0.0,0.0,-1)
0105        CALL PLOT(3.5,1.0,3)
0106        DO 1 I=1,NA
0107        BA(I)=BA(I)/(SB*FLOAT(NS(I)))
0108        XV=XP(I)/2.+3.5
0109        YP=BA(I)*50.+1.
0110        IF(YP.LE.0.2)YP=0.2
0111        IF(YP.GE.9.8)YP=9.8
0112        CALL SYMB(XV,YP,0.14,NG,0.0,-1)
0113  1     CONTINUE
0114        WRITE(6,99)NG
0115  99    FORMAT(1H0,"NORMALIZED WEIGHTS FOR GROUPS OF",I3)
0116        WRITE(6,98)(NS(I),I=1,NA)
0117  98    FORMAT(1H ,"#",11I6)
0118        WRITE(6,97)(XP(I),I=1,NA)
```

```
0119   97     FORMAT(1H ,"X",11F6.1)
0120          WRITE(6,96)(BA(I),I=1,NA)
0121   96     FORMAT(1H ,"Y",11F6.3)
0122          WRITE(4,95)(NG,NS(I),XP(I),BA(I),I=1,NA)
0123   95     FORMAT(I2,",",I3,",",F5.1,",",F9.5)
0124          CALL LLEFT
0125          RETURN
0126          END
0127          END$
```

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